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SIMON BARUCH

An Epitome of

Hydrotherapy

For Physicians, Architects and Nurses

By

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To
BERNARD M. BARUCH

IN APPRECIATION OF HIS FILIAL DEVOTION AND UNSTINTING
SUPPORT OF THE AUTHOR'S LIFE WORK

INTRODUCTION

OBSERVATION of the methods pursued and of results attained in the practice of Hydrotherapy during the past thirty years have led the author to the conclusion that there is need for a brief but practical review of its principles and methods in order to ascertain and remove the causes of misapprehension that have been brought to his attention. Such is the purpose of this last message to his colleagues on a subject to which he has devoted the better half of his professional career. The latter is offered as warrant for his perhaps too candid comments.

That he has in a measure succeeded in arousing an active interest in Hydrotherapy in this country is evidenced by the fact that since his book on *The Uses of Water in Modern Medicine*, published in 1893 (which, by the way, was the first original work in the English language), and since his text-book on *The Principles and Practice of Hydrotherapy* in 1898, followed by two other editions, republished in London, Paris, and Berlin, four meritorious works have appeared in this country by American authors.

Moreover, large hospitals—civil and military (reconstruction)—also many sanatoria and health resorts have regarded it as a *sine qua non* of being up to date to construct costly Hydrotherapeutic instalments. Unfortunately, many of the latter are content with the mere possession of these facilities for utilizing the remedial uses of water in chronic maladies, but do not achieve their full value.

That physicians do not obtain the best results from Hydrotherapy has so often come to the attention of the author that he has undertaken in this volume to direct attention to some of the causes of failure and the facile methods of removing them, not only in chronic, but acute and subacute ailments.

Recognized and unrecognized failures in ambulant cases, treated in institutions, are often traceable to:

1. Faulty instalments planned by otherwise capable and even eminent architects and plumbers, who appear to have no conception of the aims of Hydrotherapy. Many of these are well informed in other branches of their profession, but either fail to obtain authoritative counsel or, singularly enough, decline to follow the latter.

Examples illustrating the latter will appear in the chapter on Hydrotherapeutic Instalments.

To remedy this serious handicap the author has introduced a chapter on Hydrotherapeutic Instalments, which is novel in works on Hydrotherapy. Correct plans of existing institutions which have been in successful operation for many years are presented, and defects, gathered from actual observation, are briefly stated to serve architects as guides in the future. Such guides being hitherto absent, the constructors of the cited faulty instalments cannot, as is pointed out, be criticised, except in some instances for obstinancy, which have cost their clients much loss of time and money.

Naturally, the author has omitted the names of architects and institutions cited as faulty.

2. Hydrotherapy is mostly administered in hospitals, sanatoria, and health resorts by massage operators and others, who, despite their earnest desire to produce the most favorable results, fail because they have not received proper instruction in the principles and technic of this branch of Therapeutics.

That it is of the utmost importance to add Hydrotherapy to the curriculum of the Nurses' Training Schools cannot be too forcibly emphasized. This is especially demanded in the Reconstruction Hospitals, in which the author has found the personnel woefully deficient in Hydrotherapy. Brief but complete descriptions of the technic and of the principles upon which it is based, with abundant illustrations, particularly of the most useful home procedures, which may serve as a text for instruction, are

presented in this volume in order to remove some existing erroneous conceptions. The author has rarely met a nurse who knew the technic of a throat compress or of an intestinal irrigation executed according to the correct rationale as explained in the chapters on this subject.

3. That otherwise capable colleagues are more or less unfamiliar with the theory and technic of Hydrotherapy is due to the fact that text-books on *Materia Medica* and *Therapeutics* are deficient, incorrect in, or entirely omit instruction on this subject. In some instances, as in sunstroke, the author has proved the fatality of its Hydrotherapy in the best text-books.

To remedy this defect the author has devoted the better part of his professional life. The most regretable incident of the latter has been his unavoidable relinquishment of the chair of Hydrotherapy at the College of Physicians and Surgeons, Columbia University, which enabled him to train 500 students without difficulty and little encroachment on other studies, like *Pharmacology* and *Materia Medica*, which may be more epitomized without detriment. It is to be hoped that the reader may strive to restore Hydrotherapy to the regular curriculum.

The chapters on Typhoid Fever, Influenza, Sunstroke, Tuberculosis, Neurasthenia, etc., are introduced as examples to illustrate the value of water in their management, and to point out the procedures best adapted to them, together with their rationale, without which no intelligent physician should apply water.

The chapter on *whirlpool baths*, although originally it treats of war wounds, has been entered into somewhat completely because its rationale promises valuable results in civil practice.

The author desires to express his obligations to Colonel Owen, Chief of the Surgeon-general's Instruction Library, for enlargements of a fine film of the wet pack, which has proved its instructive value on the Hospital Ship *Solace*, as shown on page 63.

In the preparation of illustrations Mr. E. L. Penfrase,

Mr. Frank Richter, and Messrs. Werner and Windolph have rendered material aid, as did Wallace A. Mannheimer, Ph. D., in arranging them for the proof sheets during the author's illness, all of which are gratefully acknowledged.

The publishers are entitled to credit for the artistic enlargements of these tiny films and for the perfection of other illustrations.

The author hopes to achieve the conviction of his colleagues that water is an important integral part of our *Materia Medica*, requiring the same careful preparation, exact dosage, and precise administration as do drugs. When this is consummated one may no longer encounter a statement like the following quoted from an otherwise excellent article on influenza: "Hyperpyrexia can be met by Hydrotherapy, which likewise relieves the nervous system," the method of application being entirely omitted. This is obviously as incorrect, misleading, and dangerous as it would be were the word Drugtherapy used instead of Hydrotherapy.

The author is indebted for some material to the publishers of his larger works, to *International Clinics*, *Therapeutic Gazette*, *Medical Record*; and *Boston Medical and Surgical Journal*.

SIMON BARUCH.

NEW YORK CITY, N. Y.
July, 1920.

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AN EPITOME OF HYDROTHERAPY

POSITION OF WATER IN THE MATERIA MEDICA

OF all remedial agents in use since the dawn of medicine, water is the only one that has survived all the vicissitudes of doctrinal changes because its rise or fall was always contemporaneous with the rise and fall of intelligence among medical men, among the most eminent of whom in ancient and modern times we find its warmest advocates, especially during the past decades, representing the most enlightened period of medicine.

Enthusiasts had at one time built a system of practice called Hydropathy upon the almost universal applicability of water in diseased conditions. While this fallacy has been demonstrated, the scientific physician recognizes that water may be placed in nearly all the categories of the *Materia Medica*.

1. As a *Stimulant*: Experience has shown that in the treatment of a fainting person a dash of cold water on the face and chest is preferred to any other stimulant. In typhoid fever the muttering delirium, lusterless eyes, the apathetic countenance, galloping, compressible, and dicrotic pulse are often removed as if by magic by a "cold" tubbing. The sufferer emerges from such a bath a changed being and the whole aspect of the case is changed by the *stimulating* effect of water.

2. As a *Sedative*: It would seem absurd to make this contradictory claim of water, and yet even the lay people know the soothing effect of baths of 100° to 102° F., and those who have observed the calming of maniacal patients by the hammock (continuous) baths of 100° F., when

most powerful drugs have failed, bear testimony to its great sedative action.

3. As a *Tonic*: The improvement of appetite, digestion, and nutrition in tuberculosis and other diseases leaves no doubt that this is the tonic "par excellence" when properly applied. (See Neurovascular Training, p. 129.) The author has used this agent to the exclusion of medicinal tonics for the past twenty-five years with satisfaction. The records of the Montefiore Hospital, the Sea View Hospital, and his largely attended clinics (Vanderbilt and Riverside) testify to this fact.

4. As a *Diuretic*: Drinking of small quantities of ice-water combined with external applications, which will be discussed later, has increased the urine 50 to 100 per cent. and diminished its toxicity.

5. As a *Diaphoretic*: The "hot bath" is well-known even to the layman.

6. As an *Emetic*: Large drafts of tepid water have long been used, and when the most powerfully irritant emetic fails in narcotized patients, lavage is the only refuge.

7. As a *Purgative*: The action of an enema is familiar even to the layman.

8. For the promotion of *Metabolism* certain water procedures are extremely useful.

9. As an *Aseptic*, boiled water; as an *Antiseptic*, steam, has become the established practice.

10. As an *Antipyretic*: The prolonged bath of 95° to 100° F. has established itself as superior to medicinal agents, without the injurious action of the latter.

11. As a *Hypnotic*: The wet pack, to be described later, has no superior.

12. As a local *Anesthetic*: Known to surgeons as the Schleich method.

THERAPEUTIC TEST

No remedial agent merits the confidence of the physician unless it fulfils the following conditions:

(a) Ready accessibility; (b) a rationale ascertained by experiments on a physiologic basis; (c) facility of dosage; (d) reliable clinical observations.

That water meets all these demands will appear in the following pages.

Water is not only readily accessible, but it may be used in the liquid, solid, and vaporized form, each of which has its therapeutic value, as will be shown.

THE RATIONALE OF HYDROTHERAPY

THE *action of water* in disease is based upon its action in health. The latter, therefore, demands a clear understanding.

The Skin.—Since the skin and water are the chief elements of this therapy, it becomes important to briefly outline the structure and physiology of the former and the physical properties of the latter. The upper layer of the skin, the epidermis, is merely a protective coat which, not being supplied with blood-vessels and nerves, precludes, when unbroken, the passage of fluids but not of gases, a fact not generally known or heeded. The urine of a man, who after the meatus urinarius was sealed with collodion lay in a bath of iodid of potassium solution for an hour, was found free of iodine, even under the spectroscope.

Although itself insensitive the epidermis is capable of conveying impressions just as the sleeve of a coat may do to underlying parts. The skin is rendered waterproof and pliant by the sebaceous secretions which cover it.

Beneath this protective epidermis is the true skin containing the following structures:

Elastic Fibers.—The elastic fibers form a network which, by its disposition, lends itself to the special functions of the skin in the various parts of the body, and by its structure admits the blood-vessels and nerves, which endow the skin with the most important functions connected with hydrotherapy.

Muscular Fibers.—The muscular fibers of the skin are of the involuntary variety. Besides these muscular fibers, the arrectores pili form a tense structural union with the parts of the cutis vera which lie between the papillary tissue and portions of the hair follicles. Combining with the

oblique muscular fibers which are embedded in the skin they regulate to a certain extent secretion and circulation, the movement of lymph, and, consequently, the nutrition. This explains the vital import of the contractility of the skin when exerted upon the small blood-vessels contained in it, as will be shown in the Rationale of Reaction.

The Vessels.—The papillæ contained in the upper layer of the true skin contain loops of minute blood-vessels, venous and arterial capillaries, which rise perpendicularly to the near vicinity of the epidermis, nourishing it, and furthering exchange of gases and secretion of the aqueous portions of the perspiration. All the vessels of the papillary tract, as also the larger branches which pass through the skin, consist of only an endothelial tube, to which are added the very *insignificant media and adventitia in the vicinity of the subcutaneous tissue*. Hence their character is chiefly capillary.

The Nerves.—The anatomic distribution of the nerves throughout the skin and their connection with the central nervous system is so perfect and complete that not the finest pin-point may penetrate its uppermost layer without calling into action all those agencies by which the human organism protects itself against threatening dangers or deleterious influences.

That the skin performs one of the most important functions in the maintenance of life is demonstrated by the fact that destruction of its major portion terminates life. This is due to the fact that it contains the sense of touch. Sight, hearing, or smell may be destroyed without menacing life—the loss of sensation is always a menace. Burns involving over one-third of the skin are fatal.

The nerve apparatus of the skin offers facilities for perceiving pain, temperature, and space, the aggregate of which endows it with all the intricate functions of an organ of sensation.

The cutaneous nerve endings stand guard, as it were, over most of the functions of the human body. They are constantly exposed to irritation by heat and cold,

which they convey to the vasomotor, respiratory and cardiac centers, and to the muscles, in order to arouse in them by reflex action such a degree of innervation as may be required to ward off any damaging influence that may approach from without.

This is the true physiologic basis of hydrotherapy, which adapts its attacks by cold and heat to the indications in each individual case, as will be clearly shown in these pages.

The importance of *the skin as an excretory organ* is so well established that it requires only mention here. That the skin excretes so many deleterious elements that the suppression of the latter invariably and quickly becomes a lethal factor is, however, erroneous. Death by covering animals with impermeable substances is now known to be due to a disturbance of the heat regulation by which the inner temperature is finally reduced below a safe point, and not to the retention of toxic material.

Nevertheless, the similarity in the anatomic structure of the skin and the glomeruli of the kidneys, and the chemical resemblance of perspiration and urine, go to show that the skin is an indispensable aid to the kidneys. That the perspiration and urine are, to a certain extent, vicarious excretions is proved in diseased conditions. The wise physician utilizes this vicarious action when occasion offers. A correct understanding of the physiology of the skin and the effects of water applications upon it become of paramount import in these trying cases. The latter has been recognized since the earliest days of medicine.

The maintenance of *temperature equilibrium* is perhaps the most important cutaneous function. When the body is exposed to temperatures much below its own there ensues a contraction of the muscular structures of the skin (*cutis anserina*—goose-flesh); the vessels enmeshed in the *cutis vera* are compressed and circulation of the blood within it is diminished. Less heat is now lost by reason of the compression of the cutaneous vessels and excretory

glands and ducts receive a smaller blood-supply. Cardiac action is intensified, arterial blood is driven with more force to the interior vascular area and through the muscles, enhancing the heat-producing capacity of the latter and stimulating it to compensate for the loss of heat at the periphery. The voluntary muscles too usually respond to the demand for more heat by the desire for motion.

Exposure of the body to high temperatures evokes opposite effects. The heat-regulating center in the medulla oblongata is stimulated, the muscular structures of the skin relax, the cutaneous vessels become full, furnishing a better blood-supply to the excretory apparatus of the skin, the inner vascular area is depleted. The cutaneous glands secrete freely, evaporation and heat radiation ensue; the blood is cooled and the body temperature is reduced.

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THE PHYSICAL CHARACTERISTICS OF WATER

THE modifications to which water may be subjected render it a most flexible therapeutic agent. Its temperature may be readily changed and adapted to varying conditions. Moreover, water absorbs and gives off heat and cold quickly. This fact may be easily ascertained by standing nude in a bath-room at 80° F. after the tub has been filled with water at the same temperature. There will be no discomfort from exposure to the air at this temperature in a closed room, but quiet submersion in water of the same temperature would produce an impression of cold and a desire to move; a sense of chilliness would impel withdrawal if the bath be prolonged without friction or motion. This can only be accounted for by the physical law that water gives off its temperature twenty-seven times more rapidly than air to objects with which it comes in contact.

Another peculiarity of water is its capacity for being projected upon the body with more or less force, the physiologic action and uses of which will be made clear later.

Like other powerful remedial agents, water had been utilized for a long time (over two thousand years) before its true action was studied.

Upon the flexibility of water the Hydropaths built a system of treatment which, while it obtained great influence over the lay people, estranged the medical profession, unfortunately, to the detriment of patient and doctor alike. The explanation of its rationale on a physiologic basis has rescued it from empirical uses. Hydropathy is the empirical, Hydrotherapy the scientific, application of water in disease.

The author would emphasize the fact that *water acts as a medium for conveying temperatures—heat and cold—to the skin*, thereby producing excitation of the peripheral sensory terminals, which are so abundant in all parts of

the skin. The arousing of a fainting person by a dash of cold water offers a familiar illustration. The excitation, as is well known, of the cutaneous nerves by the water is conveyed to the central nervous system and quickly reflected upon the organs which are supplied by the latter. That heat conveyed by water will produce a similar effect I have had occasion to note. In a case of unconsciousness in a suicidal attempt with carbolic acid, ice-water failed. In this emergency I poured water just below the boiling-point over one leg. This aroused the patient quickly, and the pain from the burn continued to maintain her alertness without ill effects until the danger passed.

Mechanical impact of water, delivered under pressure upon the skin, also produces an excitation of the sensory terminals. This is demonstrated by the recognized superiority of refreshing action from a shower- over that of a tub-bath. Being upon one occasion called to see a man in a state of cataleptic unconsciousness and failing to arouse him with cold water poured from a pitcher upon him, I directed a strong stream from a siphon of Vichy, which happened to be accessible, upon his chest, which immediately aroused him.

Without entering into explanations of the stimulating action of temperature and impact (pressure) of water delivered upon the skin,¹ it will suffice for practical purposes to state that water below the temperature of the skin is preferable for therapeutic purposes because its action, while briefly depressant primarily, becomes quickly stimulating, while water considerably above the temperature of the skin stimulates primarily and depresses secondarily. Moreover, since the *effect of a hydriatic procedure is governed by the difference between the temperature of the skin and the water*, cool or cold water may be used with impunity, though the latitude ranges from 90° to 40° F. Water above the temperature of the skin cannot be safely used above 115° F., which provides only one-half this latitude.

¹ See *The Principles and Practice of Hydrotherapy*, pages 3 to 95, by Simon Baruch, M. D., Wm. Wood & Co.

SHOCK AND REACTION

FEAR of shock deters many from prescribing "cold" water by reason of physicians being familiar only with the depression of vital powers which this term implies in medicine. The fact is that the so-called shock from correct cold applications is but an unpleasant surprise to the nervous system, just as when one hears distressing news one is "shocked" without depressing effect upon the vitality. The more sudden the surprise of the cutaneous nerves by cold, the more intense is the impression on the central nervous system; a "brief shock" is stimulating, but when prolonged the surprise ceases and it may become a real shock, detrimental if the patient is unconscious or the bath is persisted in despite the patient's protestations. *There is absolutely no more danger from the intelligent application of cold water than from the intelligent administration of morphin or other drugs.* Indeed, the danger of careless administration of morphin, for instance, is far greater, for even after efforts at neutralization have been initiated the elimination of the drug must be awaited, while any threatening of shock from cold water may be readily removed in a moment. This fact alone must reassure the inexperienced.

Methods of Preventing Shock.—The author has adopted certain simple rules that may preclude the occurrence of shock:

1. Draw the back edge of the nail of the index-finger with very gentle pressure over the skin of the chest; a pink line appears if the patient's resisting capacity to shock is good. The more rapidly the line appears and the more vivid its color, the better will the patient bear cold procedures. Response to this mechanical excitation

furnishes a fair index to the ability to respond to thermic excitation. It was my privilege to demonstrate this fact to Prof. Winternitz in his Vienna clinic in 1902.

2. Always use friction *during* the procedure when cold water is applied. There is one exception—the *Wet Pack* (page 54). This procedure is never applied in feeble patients who have not been previously trained to accept “cold water.”

3. Reduce the water temperature one degree or more as indicated *at each treatment*. Reducing the water temperature *during* the procedure to avoid shock on the supposition that shock is thereby diminished is, unfortunately, a common error. Experience teaches that a sudden brief application of “cold” water never produces shock; on the contrary, it is a stimulant, as in the familiar cold dash upon a fainting person, or the cold morning shower, whereas a prolonged application of water at the same low temperature may produce collapse even if gradually reduced.

4. It is, unfortunately, a common practice among the inexperienced to discontinue hydrotherapy or raise the water temperature if the patient does not respond well to cold water. Experience teaches that water of the same temperature applied over a smaller surface or a shorter duration of the procedure is less shocking and may even stimulate. This is the correct practice when shock is feared. Day by day a larger surface and longer procedure will inure the patient to a temperature to which he appears not to have responded well previously. The temperature may now be decreased one degree daily, as in the beginning of the treatment. Raising the water temperature in accordance with the patient's wishes because of his fear of cold water is to be deprecated, for it often leads to abandonment of the treatment.

Shock from cold water is, therefore, a bugaboo of inexperienced hydrotherapists. Nurses are especially warned to resort to the above guiding precautions, since hydriatric prescriptions in chronic cases are usually written

for several days. Personal prejudice against "cold" water for delicate individuals must be set aside in favor of exact observations on the patient's real condition either by the nurse's report or the physician's personal attention.

Reaction.—The aim of all cold procedures—and these predominate in hydrotherapy—is to adapt the technic to the therapeutic indications. For this reason precise directions by the physician and correct observations and reports by the nurse are more essential in hydrotherapy than in drug therapy.

The author has simplified the observation and report of reaction by the nurse as follows:

Although the patient may complain of chilliness during the treatment, the latter must not be abandoned, since the cause may be emotional. If the patient feels chilly twenty or thirty minutes after the procedure, reaction may be regarded as defective; the next treatment, however, must be *with the same water temperature*, but more brief and gradually increased, as above described, until he reacts to the same temperature. If the patient does not feel uncomfortable one-half hour after the procedure, reaction may be regarded as fair; if the patient feels exhilarated, reaction may be pronounced as good; if, in addition, the skin becomes pink during or after the treatment, reaction is excellent. Chilliness alone may be subjective; when chattering of the teeth, actual rigor, or cyanosis are, however, observed, the reaction may be regarded as very poor. But even in such a case the treatment must not be abandoned. Other procedures of very brief duration with friction during and after the treatment may, as will be shown, train the most refractory case to respond well.

Rationale of Reaction.—Confidence of physician and nurse may be established by a careful study of the physiology of reaction.

The effect of thermic or other external irritation on the circulation has become trite, since observations with the

microscope upon the transparent frog's web have been made. Pricking the back of a frog with a needle produces an immediate increase of activity in the blood current of the web, accompanied by a slight and brief narrowing of the vessels, but the normal caliber is quickly restored if the application is brief and not intense. Irritation with pincers of the frog's back provokes a more decided narrowing of the web, which, however, quickly gives way to a dilatation of the vessels accompanied by a slowing of the circulation; the return to the normal condition is more slow after such intense irritation. If the latter is still more intense, dilatation of the vessels ensues at once, accompanied by stasis. If still more intense, as striking the frog's belly, as in the Golz experiment, the circulation is entirely stopped. The physiologic law deducible from this and other experiments is obvious, namely, that feeble cutaneous irritants enhance the normal "tone" of the vessels; increased irritation overstimulates and extreme irritation paralyzes the vessels. Without entering into tedious details which are familiar to the tyro in physiology, it may be stated positively that these effects are due to reflex action through the vasomotor center. Foster has shown that the vasomotor action is more manifest and important in the case of the small arteries than in that of the larger. The "tone" of the peripheral circulation by which, as is well known, cardiac and arterial action are chiefly influenced is thus maintained by the vasomotor center. That the latter may be acted upon by irritation of the cutaneous sensory terminals has been clearly demonstrated physiologically and pathologically. *This is the key to the action of all hydrotherapeutic procedures.* Mild thermic applications stimulate, more intense applications enhance, the stimulating effect, but too intense applications, depress instead of stimulating.

The temperature, duration, and mechanical action of each procedure determine its physiologic and, therefore, its therapeutic action, because these elements determine the extent of the thermic and mechanical excitation of

the cutaneous nerves which is reflected through the vasomotor center upon the entire circulation. Moreover, the respiratory center is also aroused if the thermic excitation is intense enough. In this manner the refreshment following the more intense procedures may be graduated in the most delicate and precise fashion by carefully adapting these three elements, as will be shown under the caption of "Hydriatric Prescription," to each individual case.

It is obvious that the physiologic action of drugs has no parallel to this versatility, and, therefore, their effects are far less adaptable in treatment of disease by water.

To render the important subject of reaction more clear the author has divided it into (a) local and (b) general reaction.

Local reaction may be readily studied by applying a small flat piece of ice wrapped in gauze upon the skin. Gently pressed upon the skin for one or two minutes it produces an evanescent blanching which is followed by a pink hue. The colder (ethyl chlorid) or longer (ice) the application is made, the more pronounced is the blanching and subsequent redness in the normal individual.

The author's theory of reaction is as follows:

The blanching is due to contraction of the muscular and elastic fibers of the skin by the cold which results in pressing the blood out of the cutaneous capillaries lying beneath and within them, and if very intense, also of the arterioles and veins. When the cold is removed the contracted muscular fibers relax slowly, being warmed by the blood flowing into the affected part from all sides. The previously narrowed vessels relax and permit warm blood to flow into them (Bier's blood sense) more freely than in the previous normal state. The result is a hyperemia of longer or shorter duration, which may be designated as *tonic reaction*.

When a larger part of the body is subjected to cold, as in a tub-bath of 20 degrees below the normal skin temperature, the process is not exactly the same because the cold

is never so intense in the bath. Here the sudden impact of cold upon a large skin surface produces the so-called shock or surprise of the cutaneous terminals, which is quickly conveyed to the respiratory center, producing the familiar gasping and subsequent deepening of the respiration.

The vasomotor center also receives a powerful stimulus and consequently responds by enhanced cardiac action. Meanwhile the local effect of cold upon the entire cutaneous surface produces in a milder degree contraction of its musculature and consequent pressing out of the blood from the capillaries, which are but endothelial tubes devoid of muscular or elastic coats. The skin becomes pale, the patient shivers if he is not vigorously rubbed. While the cutaneous vessels are thus narrowed and the cutaneous musculatures are more or less contracted, the heart is driven to enhanced activity by the vasomotor stimulation which sends the blood current into the peripheral vessels, warming the cutaneous muscular fibers and thus relaxing them, and furthering in this manner the hyperemia which we find in very healthy individuals, but which in fevers must be furthered by friction. This is general reaction.

Reaction is modified by the patient's physical and mental condition. It was my privilege to demonstrate the former to the class of the Naval Medical School where Admiral Kennedy courteously furnished me a feeble and a vigorous subject for this purpose. When chlorid of ethyl was applied to a small cutaneous surface of the vigorous sailor the skin became blanched and intense redness followed the withdrawal of the stream, while in the anemic sailor the blanching was less pronounced and no redness ensued. Needless to mention that in hydrotherapeutic procedures no cold so intense as that produced by ethyl chlorid is ever applied. This incident is cited to impress upon the reader the rationale upon which all hydrotherapeutic prescriptions must be based.

The author has often observed that the mental attitude

of the patient modifies reaction. This, however, is not so obvious as is the effect of the physical condition.

It is the function of the nurse to take cognizance of the mental as well as of the physical condition of the patient, and record these, if the physician is not present during the procedure, so that the latter may have a guide for further prescriptions. Another important point to observe is the fact that the stage of the malady in acute cases influences the reaction, for instance, in the first stage of an infectious fever, like typhoid, the patient's reactive capacity is far better than in the later stages, when prolonged toxemia has depreciated the organism.

It is obvious that a clear understanding of the rationale of reaction, as here briefly outlined, may serve as a safe guide to those procedures which are regarded as dangerous by the timid and inexperienced.

This chapter cannot be read too often by nurses, for upon its correct conception depends success or failure.

APPLICATION OF WATER IN DISEASE

MUCH of the prejudice existing against hydrotherapy is due to the more or less incomplete methods adopted and insisted upon by certain advocates of this treatment. It is the aim of this work to simplify hydriatric procedures by modifications which the author has found of value in his general practice (private and hospital), and to divest it of mysticism and empiricism.

NECESSITY OF PRECISION

The first element of success in all hydriatric procedures, and one in which the nurse plays the important rôle for achieving, is *precision* in executing them, with regard to method, duration, temperature, etc. The absolute necessity of an exact technic in the application of water as a remedial measure is, unfortunately, not appreciated by the profession, and its neglect is undoubtedly a cause of the failures which have operated in preventing the more general adoption of hydrotherapeutics by the practitioner.

Water is so simple, so readily obtainable, and so easily applied that it would seem an unnecessary refinement to enlarge upon the methods of its application. On the other hand, too, the empirical hydropaths and water-cure doctors have divided and subdivided their procedures into numerous baths and douches, etc., each one infallibly adapted to certain conditions. It shall be our aim to steer between the Scylla of indifference and the Charybdis of overactivity, to simplify these methods, and to instruct the reader in such hydriatric procedures as his common sense will enable him to apply under the guidance of physiologic and pathologic principles.

The first step in this direction is the appreciation of the fact, while there is no sleight-of-hand or mystery in the hydrotherapeutic methods, there does exist a necessity for *absolute precision* in the application of water, simple and universally applicable though it be. A few illustrations from our clinical experience will impress this lesson more forcibly than the simple statement.

CAUSES OF FAILURE

Example 1. The house physician of one of our metropolitan hospitals informed the writer that "the cold bath treatment of typhoid fever" had been inaugurated in his institution. Inquiry regarding the method adopted elicited the fact that the patient was wrapped in a wet sheet, and ice-water was poured from a carriage sponge over the entire surface of the sheet until the body temperature was decidedly reduced and a reduction of 5 degrees had been noted. The prognosis made by the writer, that the woman would die under this unphysiologic management, was verified in two days. Failure in this case is attributable to the fact that refrigeration was the chief effect of the treatment. The success of the hydriatic management of typhoid fever rests, as will be shown, upon the principle that the refreshing influence of water decidedly below the skin temperature upon innervation is the important indication. *The latter is fulfilled by promoting reaction* by friction of the entire body during the bath. Water at too low a temperature is fatal to reaction in these depreciated cases.

2. An eminent tuberculosis expert wrote to the author in reply to a plea for the instruction of his students in hydrotherapy that he valued it so highly that he usually directs his patients to take a cold wash every morning. Considering that in this climate water from the cold faucet fluctuates between 45° and 75° F., according to the season, this haphazard prescription would be injurious in many cases, without giving specific directions, which a physician should never omit, with regard to temperature,

duration, and time of the "cold wash." This justly eminent teacher would not be guilty of so indefinite a prescription of fresh air or exercise in tuberculosis.

3. The favorite prescription of an eminent neurologist is "hot box and Charcot douche," leaving to the judgment of the attendant the duration of the first, whether it should proceed to perspiration or not, and the temperature, duration, and pressure of the latter, which means a spinal douche. He would not be so negligent in prescribing drugs. To neutralize the danger from such prescriptions I have endeavored to familiarize nurses with the principles of hydrotherapy. The nurse is thus enabled to correct such errors as does the druggist in other prescriptions.

4. In one of the largest hospitals in this country I saw a prescription for "a Scotch douche at 90° F.," written by the chief of a division, which proves that the writer did not know that a Scotch douche consists of *two* streams of water, one considerably below, the other above the temperature of the skin, usually 70° and 115° F.

5. The chief of the medical division of the same hospital stated that since he heard the author lecture on cold baths in typhoid fever he had always used water in febrile and other cases. When I asked his chief nurse on another occasion for a bath thermometer she could not produce one. This was an empty compliment, indeed.

6. An eminent orthopedist telephoned to know if hydrotherapy could be practised in a hotel. Replying in the affirmative, if water, a thermometer, a tub, and towels could be procured, he asked to have a competent nurse sent to him. The latter discovered the case, a morphin habitué with an incurable surgical lesion, to be unsuitable for hydrotherapy.

7. Quite recently the author was informed by a friend that she had been treated by the most eminent consultant in her state for *insomnia* without success, and was sent to a sanatorium in consequence. Being asked if she

had used the wet pack, she replied in the affirmative, saying that she was placed on a rubber sheet previously covered with a cold wet sheet, in which she lay wrapped until she was thoroughly chilled. In response to the question if she had been wrapped in blankets, she also replied in the negative! (See p. 58.)

THE HYDRIATRIC PRESCRIPTION

To avoid failures due to indefinite directions to nurses the author has devised a method of prescribing water that fulfils all therapeutic demands, basing the prescription upon the well-ascertained facts that the effects of all hydriatric procedures are governed by

- (a) The temperature of the water.
- (b) The duration of the procedure.
- (c) The added mechanical impact from pressure.

These are definitely stated in every prescription, as will appear in the following detailed technic of hydrotherapy.

Compared to drugs, water offers a wider latitude, and for this reason demands more careful prescribing.

(a) For example, the *temperature* may be prescribed in safe limits from 40° to 110° F. for the douche; 70° to 108° F. for the tub-bath. It is obvious that a bath at 70° F. would be quite different in effect from that of 100° F. This being true, each degree or number of degrees must produce a different effect. For this reason the terms "tepid," "warm," "cool," "hot" should never be used in prescriptions.

(b) The same is true of *duration*. The difference would at once become obvious if a dip or plunge at 60° F. were to be prolonged into a bath of five or more minutes. It would be absolutely unbearable. And yet such a bath is described in Sir Lauder Brunton's Lectures on the Action of Remedies in the Pharmacopœia of the St. Bartholomew Hospital. No wonder he warns against collapse. I have never dared to prescribe a tub-bath below 65° F., always given with good friction; and in the last thirty years 70° F. has been the lowest (in the Brand bath).

(c) The difference in pressure is well demonstrated in the tub- and shower-bath, if the latter is delivered with 10 or more pounds pressure. Upon this difference is constructed the prescription of the douche, which admits in the apparatus devised by the author of a latitude from 5 to 40 pounds pressure. The former elicits little reaction; the latter produces a red streak which quickly disappears.

In prescribing water there are other elements to be considered: (1) The nature of the malady. This is illustrated by comparing the case of the stillborn infant with a typhoid case. In the former dipping suffices; in the latter prolonged immersion is demanded. Immersion would be fatal to the former; dipping would be too feeble in the former.

(2) Stage of the malady—will be explained in the management of the early, middle, and late stages of infective diseases. (3) The physical and mental condition of the patient—will be explained in the management of tuberculosis and neurasthenia.

In view of these facts *the reader is urged to adopt precision in prescribing* temperature, duration and pressure, and to adopt a gradual decrease or increase of these as described in Neurovascular Training until he has by practice become familiar with the effects of water.

Before proceeding to the technic of hydrotherapy the author would urge careful study and literal following of every step of the procedures described as the only way to prevent disappointment.

THE TECHNIC OF HYDROTHERAPY—PROCEDURES HAVING FOR THEIR OBJECT GENERAL EFFECTS

IN describing these procedures only those will be referred to whose action has been found of value in the author's personal experience or observation. Many subdivisions—as head-baths, wrist-baths, arm-baths, etc.—which are found in the books of the hydropaths and in some regular treatises will, therefore, be omitted. It is the aim of this work to simplify hydrotherapy and render it accessible as far as possible to the general practitioner. It must be reiterated here, however, that *minute attention to details* is the first essential for the successful application of all hydropathic procedures.

ABLUTION

The simplest procedure is the local or general ablution. It serves as an introduction to more active measures. It consists of the application of water by the hand, either naked or covered by a bath glove or holding a linen wash-cloth. The so-called sponging is to be avoided because it does not produce sufficient friction and thus obviates reaction. The method and the temperature of the water vary with the object in view. Two vessels filled with water of proper temperature must be within reach. In acute febrile affections, with temperature above 101° F., an oilcloth or rubber sheet is laid upon one side of the bed, covered by a blanket, and upon this a linen or old cotton sheet or tablecloth is spread, one half reaching over the edge of the bed, the other rolled upon the other half of the latter. In febrile affections the first ablution is given at 85° F. It is repeated every

two hours, if patient is awake, reducing the water temperature 5 degrees each time until 70° F. is reached. The chest and arms to the elbow, the back, abdomen, and lower extremities to the knees are successively bathed by freely applying the water. This is far superior to sponging, which is liable to chill by evaporation, while the gentle shock of the impact of the water applied in this method, accompanied and followed by gentle friction, arouses the peripheral nerves, and thus refreshes the entire system by its reflex action. Sponging is a cooling procedure; ablution with friction an antifebrile measure, cooling and stimulating. A decided difference of refreshing effect may be observed by comparing, in the ordinary morning toilet, a simple moistening of the face with a cold, wet sponge to the usual method of dashing handfuls of cold water against the face, with friction. The refreshing and antifebrile effect may be enhanced in vigorous individuals with high temperatures by not drying the body until the ablution is complete. Judgment, however, must be exercised to avoid chilling, and to bear in mind that reaction is aimed at. After the ablution the patient is dried with a thin, old linen towel; unless he shivers friction after ablution is avoided. This rule holds good in all hydiatric procedures below the skin temperature.

The Towel Bath.—Another method for enhancing the antifebrile effect is the snug placing of a linen towel (always without fringes, to prevent dripping) wrung out of water at 80° to 70° F., successively over the chest, abdomen, back, and upper parts of extremities, and throwing water at 70° to 60° F. upon them by the hand or from a sponge, followed by friction with the outstretched hand and over the wet towel. Repeated patting with the flat hand furthers reaction. This procedure approximates a bath, and often accomplishes quite as good results for reduction of temperature and refreshing effect as the full bath. By changing the temperature of the water and duration of the procedure the antifebrile effect may be modified.

After this application, which may be done several times on each successive part, the patient is dried. It is repeated when the temperature rise again demands it. *In the early stages of all febrile affections, except pulmonary and bronchial, this method will be found of value.*

In **afebrile affections**, too, the ablution and towel bath are useful preliminaries to the more active hydriatric procedures. It has long been my custom, learned in treating the desperately depreciated cases presenting themselves at the Montefiore Home, many of whose patients have been utter strangers to cold water in health even, to pursue the following course: The patient, having received a thorough warm, cleansing bath with soap and flesh brush, is wrapped, nude, in two long-haired, woolen blankets, spread on the bed. He is laid upon it with arms outstretched, and the blanket is snugly wrapped around his body and between his legs. The arms are now placed alongside the body; and the second blanket is tucked around him, so that the upper corners are firmly fastened under his shoulders and neck and the lower edge folded under his feet. He now lies like a mummy in the warm room, more covers being laid upon him. Drinking a small glass or two of ice-water will promote the action of the skin. Having lain from half an hour to an hour, and thus accumulated heat upon the surface, his face is bathed in water from 60° to 70° F.; the blankets are successively opened over his chest, abdomen, back, lower extremities, and arms, and these are successively bathed with the hand as above described, and each part immediately dried and replaced under cover. A general dry rubbing with a woolen cloth or the hand follows, and he then is made to take some exercise if he is able to do so. Otherwise, he remains in bed, and receives a cup of warm liquid food. This application is best made in the early morning hours, but may be made at any time, and repeated, as the reactive power demands, for several days.

For **ambulant cases** I advise the patient to strip to the waist, wrap a towel around the latter, to prevent water

flowing down. Dipping the middle of a linen towel into water at 90° F. (daily reduced one or more degrees) and wringing the water out more or less, the towel held with the right hand above and the left hand below is drawn diagonally across the back with long passes. It is dipped again and passed over the back in the opposite direction. This is repeated once or twice. The entire towel is now dipped and wrung out, and with it the chest is rubbed. The patient is dried and goes out of doors.

AFFUSION

A bucket containing water at prescribed temperature and a large pitcher, basin, or dipper, several towels, and water at prescribed temperature are made ready.

In **acute cases** the head of the bed is raised 6 inches. The nude patient is placed on a sheet spread over a rubber sheet supported on each side by rolled-up blankets and drawn at its lower edge into a trough hanging over the edge of the bed, beneath which is placed a vessel to receive the water flowing from the patient. A stream of water issuing from a bucket or pitcher, preferably the former, because the stream may be broader, is poured upon *successive* parts of the entire trunk. According to the height from which the water is poured and the low temperature (60° to 80° F.) will be the stimulating effect. In feeble patients it is well to begin with higher temperatures (75° F.) and short distances. The action of these brief impingements of water (the head being usually omitted and wrapped in a wet towel) is stimulating, because of more brief duration. The stimulating action may be improved by using a watering-pot, held high above the bed. Such a procedure was used with advantage in the Cuban War (see page 155). Great care is to be taken to prevent chilling. The latter may be prevented by rapid sprinkling from an elevated point and drying with friction.

Therapeutic indications are offered by conditions indicating a dynamia and nerve prostration. This was the

method of Currie, who made remarkable cures in typhus fever by pouring buckets of sea-water on the nude sailors lying on the deck. It is obvious that this procedure demands much less reactive capacity than a tub-bath by reason of friction by the stream and its short duration.

In *scarlatina*, when the system is overwhelmed by the poison, the circulation embarrassed, the skin pale or marbled or cyanotic, the respiration shallow, temperature high, pulse rapid and feeble, truly marvelous results may be obtained by the judicious use of brief affusions, given in an empty tub. Reaction occurs rapidly, and with it come an improved peripheral and general circulation, deepened inspiration, bright countenance, and roseate skin. Let not the fear of cold deter anyone from resorting to cold affusions (70° to 60° F.) in these desperate cases.

In *bronchopneumonia* of children, dyspnea, cyanosis, and high temperature are often controlled by these affusions, the patient being held semirecumbent in an empty tub, or one half-filled with water at 102° F. or over.

Under the caption of Typhoid Fever and other affections clinical evidence of its value will be presented.

In **chronic diseases** I direct the patient first to be well rubbed with a dry towel, then to sit in an empty bath- or wash-tub. Water at 90° F. (daily reduced 1 or 2 degrees until 60° F. is reached, or recovery ensues) is poured successively with a pitcher or basin, over the chest, back, and sides of the patient (Fig. 1). In domestic practice the patient may sit in an empty bath-tub with open outlet. A basin or bucket of water of prescribed temperature, beginning with 90° F., is placed between the feet. From this reservoir the water may be conveyed by and squeezed out of a sponge over these parts. He is dried standing on a rug or blanket and sent out of doors. I might give numerous observations in cases in which all the most valued medicinal and hygienic measures have failed until this simple auxiliary was added, and changed the entire aspect of the case. Even

in poor working women, in whom anemia and chlorosis are so common, who were sometimes brought to me by their sympathetic mistresses with ashen faces, cardiac bruits,



Fig. 1.—Affusion. Water poured from basin over shoulders.

glassy eyes, palpitating hearts, etc., an astonishing change has been wrought by simply resorting to such affusions. Each successive one must be decreased in tem-

perature and increased in duration. It will not suffice, however, to tell the patient, "You must wash with cold water every day," as is the usual practice. The importance and inoccuity of the gentle "shock" from the brief impact of the water must be impressed upon them, and the physician should prescribe the temperature of the water and the method of using it, as he would in ordering medicine. For the first application the addition of warm water will be needed even in the early summer months when the water is 70° to 75° F. and the air not much warmer. Later ice may be necessary in the advanced stage of treatment. A basinful of water or several basinful should be precipitated over the back, shoulders, and chest successively from a height in order to add the mechanical effect to the thermic stimulation. It is imperative that the patient describe his method of following the prescription minutely. The author has found trained nurses sometimes inexact in this regard.

Aside from their therapeutic effect, ablutions and affusions are most valuable as introductory to other hydropathic procedures in acute as well as in chronic disease, inasmuch as they furnish a clue to the reactive power of the patient and thus prevent discouragement and consequent abandonment of hydrotherapy. If, for instance, the skin remains cool and pale or becomes cyanotic after ablution and friction, we are warned to abbreviate the procedure and proceed cautiously to more intense procedures. The reactive condition of the patient is thus disclosed in chronic disease. The rationale of the action of affusions may be sought in the surprise of the peripheral nerve terminals, which is refreshing by reason of its being conveyed to and reflected upon the central nervous system.

Added to this effect we have the evanescent dilation of the superficial capillaries, as evidenced by the rosy hue of the skin following ablution with friction. We also have the deepening of the inspiration produced by the impingement of cold water upon successive parts, which improves oxygenation and the circulation of blood in stagnant areas.

If the heart's action is feeble, the improvement of tone in the peripheral circulation facilitates its work by removing the impediment existing in the correspondingly feeble cutaneous vessels. This *vis a fronte*, due to the narrowing of the vessels, evokes the need of a strong *vis a tergo* upon the part of the heart. This explains the reason why ablutions and affusions are a most valuable initiatory procedure, which the feeblest subjects may bear with impunity. That their effects differ materially from those of sponging will be evident on the first application.

THE SHEET-BATH

This procedure is a practical and ingenious method of applying water to patients who, by reason of feebleness in acute disease, are unable to accept other more heroic methods, or in chronic disease to accept it as a means of refreshing the nervous system. In chronic diseases it serves the purpose almost as well as the more frequently used douches, when the latter are not available, owing to absence of apparatus.

The sheet-bath is applied as follows: A rubber sheet is laid upon the bed, and several linen sheets, coarse or fine, according to the effect required, are placed in readiness. One of the sheets is now dipped in water from 80° to 90° F., according to effect desired, and more or less wrung out, never so completely as for the wet pack, however, which will be described later. The sheet is laid upon the rubber cloth; the head and face of the patient having been bathed with ice-water and a wet cloth placed upon his head, he is now placed upon the wet sheet and is quickly wrapped with it as follows: While he holds both arms up, the right third of the sheet is wrapped snugly, but not tightly, around the body, bringing the upper edge over close under the left axilla and the lower along the left thigh and foot. Both arms are now brought down, and the other two-thirds of the sheet is brought over the body in front, carried over the right shoulder and the upper edge, in around the neck and shoulder. The entire left edge

being snugly tucked in around the neck and beneath the right side of the body, care should be taken that a fold be placed between the extremities so that no parts of the body lie in apposition. The arms may in feeble patients be left out altogether, and simply bathed during the process. The lower border of the wet sheet is gathered around the ankles and tucked beneath the heels.

The first impression will be a shock to the peripheral nerves. This is readily overcome by the patient's own temperature, and its removal is aided by the manipulations of the bath nurse, who, with outstretched hands, gently and gradually sweeping over the wet sheet, passes over the entire body *successively*. So soon as one part of the body becomes thoroughly warmed, water from a previously prepared bucket at 60° to 70° F., according to condition of patient, is poured with a cup or squeezed from a sponge over it. These gentle passes of friction are alternated with the pouring on of small quantities of cold water, until the part feels cooled or the patient shivers. Rigor must always be avoided, because it is an evidence of a too decided temperature difference between the central and peripheral portions of the body. As the friction prevents this objectionable feature of all cold baths and enables us by the renewed application of cold water upon each warm part of the sheet to maintain the cooling effect, we have in the sheet-bath an admirable antifebrile agent. Its effect may be greatly enhanced by allowing the patient to remain in it, withdrawing the rubber sheet and wrapping him in the blanket beneath for half an hour or longer if asleep, as is often the case in the most disturbed patients.

The mildness of this procedure compared with the full cold baths renders it more acceptable to the patient and his friends, and it may thus be utilized as a valuable initiatory antifebrile measure, intermediate between the ablution and the full bath, which will be discussed later. It is applicable in all acute diseases in which an elevated temperature and depreciated vitality are leading mani-

festations, and it may form a substitute for the full bath, where the necessary facilities for the latter cannot be procured, or where objection to the full bath is insurmountable. For instance, in the country, where bath-tubs are not obtainable, linen sheets, or at least linen tablecloths (or even old and well-worn cotton sheets), a piece of oil-cloth, a blanket, or bagging to protect the bed, a bucket of water, are all that are needed. By using a sofa or lounge for administering the sheet-bath, or by placing the patient on a table or on the floor, the sheet-bath may be given with an abundance of water from the sponge or a pitcher, the superfluous water being kept from overflowing by careful absorption with a sponge or soft cloths. It should always be remembered that there is no danger of the patient with a temperature of 103° F. and over taking cold. This bugbear often prejudices the physician, as well as the patient, against all hydiatric measures.

To enhance the antithermic and soothing effect the patient may remain in the wet sheet for half an hour wrapped in the blanket. The *antifebrile action of the sheet-bath* may be explained as follows: The immediate effect upon the peripheral vessels is to narrow them by contraction of the cutaneous muscular fibers, which by compression drive the blood from the surface toward the interior. For this reason a wet turban and occasional washing of the face with ice-water are necessary to prevent retrostasis with determination of blood to the head. Since, however, the shock to the sensory nerves is brief, the local action is really evanescent. The sheet rapidly warms up if the patient's temperature is above 102° F. The addition of cold water upon each part of the sheet warmed by friction abstracts heat from the vessels which have been dilated by the frictions described above. In this manner there is a gradual cooling off and reheating of the sheet, which is conveyed from and to the parts beneath it. Each time the cold water impinges upon the sheet a deepened inspiration ensues, which furnishes more oxygen. The reactive dilatation of the peripheral vessels

in apposition to the contracted cutaneous muscular structures removes the previously existing abnormal handicap to the blood-pressure and thus gives the heart freer action, reducing the pulse-rate and increasing its tension. If the patient be allowed to rest in the wet sheet, calm sleep ensues. A rational antifebrile effect is thus inaugurated, which does not fatigue or alarm the patient so much as the full bath.

The Sheet-bath in Chronic Disease.—Not only in acute disease is this method applicable. In many chronic affections, accompanied or not by some elevation of temperature, it is a useful adjunct, and in many cases an important element in the treatment. It is called the

Drip Sheet.—When a complete hydrotherapeutic instalment is not accessible, the following procedure, after the patient's reaction has been raised by ablutions and affusions, may be used with satisfactory results: Stepping from the bed into a warm room the patient stands in a tub containing 1 foot of water at 106° F. A large linen or old cotton sheet gathered into folds, 12 inches from the upper border in the right hand of the attendant (Fig. 2), is saturated with water of 80° F. (lowered daily 2 degrees). The patient standing in the tub is directed to raise his hands. The sheet before being brought out has part of the water pressed out by stroking it with the left hand through its whole length, and its lower part quickly dropped into the empty tub in which the patient stands. The left border of the wet sheet is placed under the right axilla of the patient, who is directed to lower the arm and hold the sheet in place. The sheet is now drawn across the chest, passed beneath the right axilla, and secured by lowering the right arm. The attendant now holding the folded sheet, the lower part of which rests in the empty tub, with his right hand, stands about a foot from the patient, who is directed to turn slowly, so that he winds himself tightly in the wet sheet (Fig. 3), so that the latter passes over the back, the left shoulder, and is brought forward and secured by tucking in at the neck.



Fig. 2.—Drip sheet—first stage. (Presbyterian Hospital.)

After smoothing the sheet the attendant rubs with outstretched hands and slapping successive parts until

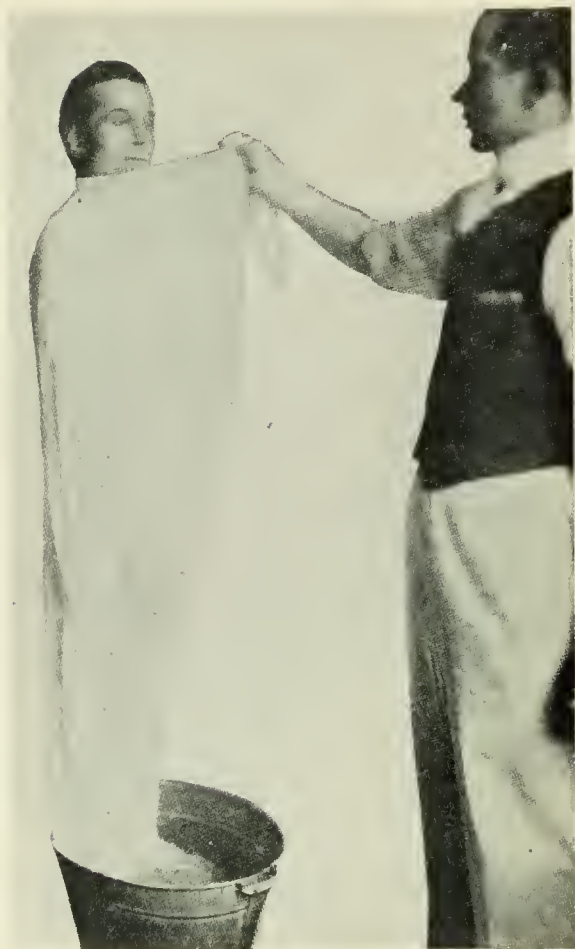


Fig 3.—Drip sheet—second stage. (Presbyterian Hospital.)

they feel warm (Fig. 4). Water at 70° F., daily reduced 3 degrees, is poured from a pitcher or cup upon the warmed part and again rubbed until it remains cool (Fig. 5). The

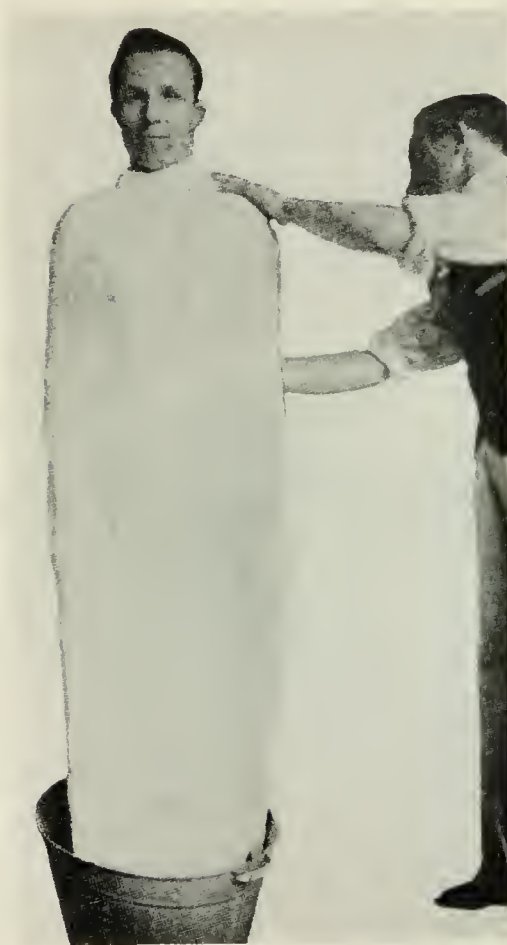


Fig. 4.—Drip sheet—third stage. (Presbyterian Hospital)

entire trunk and thighs having been thus treated the remaining water is poured over back and shoulders. Now the patient is unwrapped, steps out of the tub, is dried quickly, and sent out of doors. When a hydrotherapeutic instal-

ment is inaccessible, the *drip sheet* may fulfil all the indications of the douche. This is the author's warrant for



Fig. 5.—Drip sheet—final friction. (Presbyterian Hospital.)

the full illustrations, taken from a lecture at the Presbyterian Hospital, whose photographer made them.

Among the chronic ailments to which the drip sheet is applicable, especially as a substitute for the douche, are neurasthenia of the depressed type, hysteria, and neuritis in anemic individuals. This procedure has been in use for many years by the hydropaths for the following reasons:

The flexibility and simplicity of the method especially commend it. It is probably the most flexible hydriatic measure known. By wringing the sheet well out, or in using a coarser sheet or a lower temperature, or for a short time, or by slapping with, instead of simply passing the hand over the wet sheet, the local excitation of the cutaneous nerves and vessels will be enhanced. By saturating it with more water the antithermic effect is increased, which may be still more intensified by more prolonged application and frequent addition of colder water, or by a finer texture of the sheet. The duration of the sheet-bath is a matter for the most careful discrimination. Two to five minutes suffice in most cases for the tonic effect, while for the antipyretic effect in bed patients fifteen to twenty minutes may be necessary. It is, of course, understood that excessive sensitiveness of the skin in the presence of cutaneous diseases or inflamed surface precludes the use of the sheet-bath entirely. In the care necessary in adapting the drip sheet and other hydriatic procedures to various conditions must be sought the reason why the best informed medical men in France and Germany send their chronic cases, which have resisted simple measures, to colleagues who have made a special study of hydrotherapy and consign them to their treatment entirely. A large experience enables these gentlemen to adapt, by infinite variations, seemingly slight to the uninitiated, certain modifications which promote recovery after less intelligently applied hydriatic measures have sometimes failed. I do not desire to be understood, however, that the general practitioner is not perfectly competent to treat such cases hydriatically. On the contrary, it is the purpose of this work to lend him such assistance as may enable him to have his patients treated at home, by a

competent nurse, and to discover the limitations of home treatment, for many cases are needlessly sent away from home to a water-cure establishment in which water is anything but scientifically applied. Any nurse of average intelligence may learn this and the other procedures by a little practice.

THE WET PACK

This procedure has been found extremely useful in acute and chronic diseases. It has been long established, for it was first recommended by Lucas, an English phys-



Fig. 6.—Preparation of wet pack: *a*, *b*, Blanket over pillow 1 inch above nucha; *c*, wet sheet being smoothed out by nurse. After lecture at Naval Medical School. (Courtesy of Surgeon-general's Instruction Laboratory.)

ician, in 1750. Like all other hydriatric measures, it requires great care and nicety in its application if the results are to be adequate. The dread of a damp sheet is so intimately associated in the minds of the lay people with rheumatism and colds that the very words bring a shudder to the patient to whom it is novel, while, on the other hand, persons who are familiar with it abuse it by too frequent resort.

The technic is as follows: Two *large* woolen blankets are spread upon a mattress, most appropriately placed (*a* rubber sheet must intervene to protect it from the

moisture) upon a high four-legged cot. Upon this is spread smoothly a linen sheet, wrung out of water of temperature 60° to 70° F., appropriate to the case; the blanket should be long enough to extend 1 foot or more beyond the patient's extremities (Fig. 6). The patient is placed upon the sheet, with his arms raised alongside the head. One-third of the sheet is drawn from left to right across the chest. The arms are lowered alongside the body and the other two-thirds of the sheet are brought across the body, covering both arms but leaving the latter separated from



Fig. 7.—Wet pack. Application of wet sheet; first step. (After film by Surgeon-general's Instruction Laboratory.)

the trunk by the intervening sheet. The lower part of the latter is pressed between the thighs and legs and the lower border tucked under the heels (Fig. 7). The upper border of the blanket is now grasped with the right hand, drawn at right angles to the clavicle downward, the fingers of the left hand are placed about 15 inches from the clavicle (Fig. 8) against the border of this tightly drawn portion and held there while the right hand draws and pushes the latter across the chest over the clavicle and shoulder (Fig. 9), beneath which it is tucked. This pro-



Fig. 8.—Blanket *in situ*. Nurse preparing to reverse upper right corner of blanket across chest and throat to left shoulder.

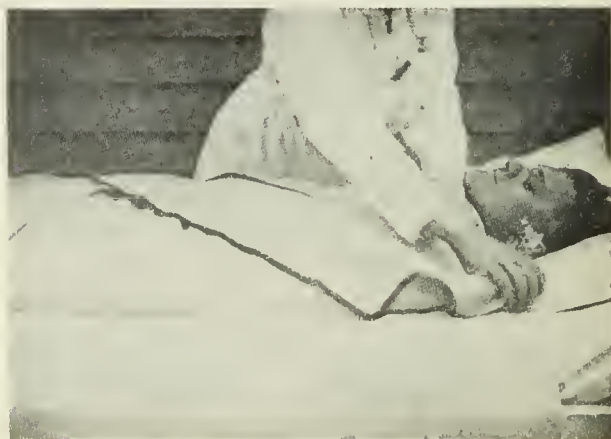


Fig. 9.—Right upper corner of blanket brought across chest and throat to left shoulder tip.

cedure is similar to reversing a bandage (Figs. 9 and 10). Then on both sides the blanket is brought over the body and

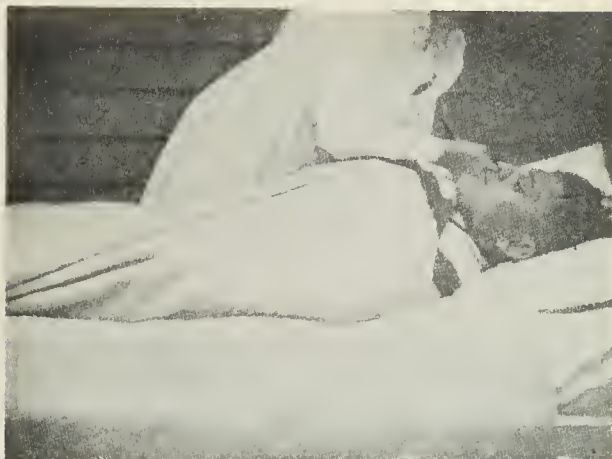


Fig. 10.—Securing upper *left* part of blanket beneath right shoulder (opposite side shown here).



Fig. 11.—Tightening of blanket.

tightly tucked under it (Fig. 11), then drawing with the left hand upon the portion of the blanket or sheet covering the patient (Fig. 12), then with the outstretched fingers of the

right hand pushing the border of the blanket covering the body beneath the latter along the entire length of the body (Fig. 12). This procedure is repeated on the other side, with the second blanket. The lower edge of the blanket is now gathered together and tucked beneath the heels. Everything depends upon complete exclusion of air from the blanket cover. The patient may now be covered with more woolen blankets if necessary. If the covering has been skilfully done the patient will resemble a mummy whose head is enveloped in a wet turban. Unless

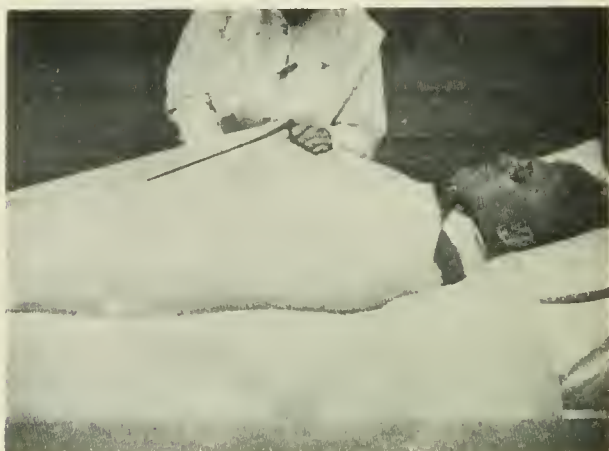


Fig. 12.—Final tightening of blanket.

given for insomnia the patient should receive an affusion at 70° F. after removal from the wet pack and go into the open air after being dried.

Modification of this procedure consists in half packs, in which smaller or larger parts of the body are enveloped in the damp sheet. The duration of the pack (which should be from one-half to one hour), the texture of the sheet, the temperature of the water and extent of pack, as well as the repetitions, modify the effect materially, as will be seen. If given for insomnia, the patient must re-

main in the pack, if asleep; rapid but gentle drying follows, and the pack must be given in the bed.

Rationale of the Pack.—The first effect of contact with the cold, damp sheet is an irritation to the cutaneous nerves, and narrowing of the cutaneous vessels, which continues until the individual's power of reaction comes into play. This depends, as in all hydriatic procedures, upon the age and condition of the patient; old people and children do not react as readily as adults, and a previous high temperature of the skin furthers rapid reaction when circulation is not very feeble. There being no mechanical aid given by the attendant, as in the sheet-bath, reaction depends entirely upon the vital powers of the patient. This fact distinguishes the wet pack completely from all other hydriatic procedures, and demands judicious recognition of the patient's reactive capacity. As soon as the first "shock" is over, which lasts one to five minutes and sometimes produces shivering, the peripheral vessels begin to dilate, and the system makes an effort to equalize the temperature between the skin and the sheet. When the body temperature is high, as in fevers, there is no chilliness, the cooled blood is driven from the surface to the subjacent structures, but very soon the warm blood from the interior takes its place, and dilatation of the vessels is the result. This continuous interchange of temperature, which occurs easily and slowly in patients with normal temperature, gives rise to a vaporization from the sheet which furthers loss of heat from the skin. This is increased by non-conductivity of the blanket. He soon experiences a mild heating of the body due to the conservative powers of the organism, continuing to create heat to compensate for the threatened or accomplished loss.

The normal production of heat continues, but the normal loss of heat by radiation and vaporization is inhibited, and loss by conduction is greatly diminished by the woolen blankets enveloping the patient. The result is an accumulation of heat on the surface of the body. This

contributes to the vaporization of the moisture in the sheet. The patient now lies in a warmer medium than that of the ordinary clothing. Consequently, he is soothed as in a warm bath. If the pack is continued over an hour, the accumulated heat manifests itself by perspiration on the forehead. The patient now is in a superheated medium, and obtains all the physiologic effects described above. If a pack is prolonged several hours, there occurs an elimination of toxins, which has been demonstrated in cholera and other infectious diseases. The primary irritation by cold arouses a reflex excitation of the respiratory and cardiac centers, reaction ensues, producing a widening of the cutaneous vascular area, the skin is so filled with blood and heated by the latter that after an hour or more the sheet will steam on removal. This hyperemia of the skin should not be interrupted; the wet pack may continue several hours. The skin now excretes more actively, producing evaporation into and through the damp sheet. The odor of the latter when removed often bears testimony to this enhanced excretion. That the relief felt by most patients, aside from the favorable influence upon the circulation, may be due to the removal of toxins, the odor of the sheet is substantiating evidence. It has been especially observed in subacute rheumatism. This eliminative process is aided materially by the excitation of cellular combustion induced by the pack. No better measure is open to the physician for furthering the combustion of auto-toxins, for transmutation of the products of regressive metamorphosis into soluble substances capable of elimination. The prolonged application of the wet pack two to three hours would, therefore, seem to offer upon this rationale a method of elimination which may serve many useful therapeutic purposes.

Laboratory Experiments.—The action of the wet pack upon trephined rabbits has been demonstrated. When wrapped in a sheet wet with water at 34° C. and covered with wax-cloth and woolen blankets, snugly tied up, so

as to leave the head only free, the temperature sank 1 or 2 degrees, but began to rise again in two and a quarter hours. The respirations became more slow and deep, and the pulse less frequent. The animals reacted less to irritants and seemed to be drowsy at first, but with the rise of temperature they became more lively and began to kick actively. Wrapping in cold (20° C.) sheets produced the opposite effects.

After a rapid dilatation the vessels of the pia mater become narrower, the brain sinks in more and more, and the dura mater is raised up by the cerebrospinal fluid, which accumulated abundantly underneath it. The cerebral movements become more slow and more equable for several hours. When the pack is removed, dilatation of the vessels occurs, but they soon resume their normal caliber. These observations are confirmed in 34 trephined persons by Glaenger (*Zeitsch. f. Phys. u. Diaet. Med.*, 1911).

These experiments render the action of the wet pack upon the human body intelligible. We often find the patient slumbering as soon as the temperature is equalized between the body and the sheet, and warmth is evolved by the reactive process which dilates the cutaneous vessels and thus furthers cerebral anemia, conducing to sleep.

Therapeutics of the Wet Pack.—*Insomnia.*—For cases of insomnia and delirium the wet pack at 70° F. is an admirable remedy. When applied in fevers the first impression of cold upon the surface will cease abruptly and give way to evaporation. This produces a soothing effect upon the cutaneous vessels and nerves and often produces sleep in patients who have been tossing restlessly before.

If this calming effect be the chief indication at that period of the disease, the patient having lost sleep or being on the verge of delirium, it would be wise to permit him to remain in the pack until he awakes and then dry him gently without disturbing his tendency to sleep. If pulse and temperature be not reduced, ascertained by

the finger on the temporal artery and by the hand, it is advisable to remove the first blanket in half an hour to prevent heat accumulation, which would thwart the antithermic effect.

The following extract from a letter from Surgeon Edward H. Old, commanding U. S. Hospital Ship Solace, furnishes reliable clinical evidence:

"During the recent epidemic of influenza a number of the pneumonia cases were delirious and very restless, having to be restrained, these symptoms being beyond control by the use of drugs. Some of the men would remain awake day and night, the whole time in marked delirium, and the condition was such as at times tried the nerve of physicians and attendants.

"Remembering the film which you showed us and your discourse on the benefit of the wet pack in controlling insomnia, we tried the treatment so strongly advocated by you on the above class of cases, and I know that you will be pleased to hear that in nearly every case it was found most successful and of marked benefit to the patient."

The following letter is the result of the author's request for further data. These indicate an almost invariable reduction of temperature, amounting in one instance to 4.8° F.

Washington, D. C., August 9, 1919.

Dear Dr. Baruch:

The report from the U. S. S. Solace, to which Dr. E. H. H. Old had reference, contained the following paragraph:

"Treatment: The wet pack, as advocated by Dr. Simon Baruch, was found to be most efficient to quiet the patient in wild delirium or suffering from insomnia. It was our experience that a patient would invariably become normal in the pack and frequently sleep for from two to four hours."

Dr. Old has forwarded the following data relative to temperatures before and after a wet pack was given in several cases:

Name.	Temperature,		Time in pack.	Nervous condition,	
	Before. ° F.	After. ° F.		Before.	After.
Mc.....	102.4	101	30'	Delirious. Very restless.	Quiet two hours.
McC.....	101.8	100.4	45'	Delirious.	Slept three hours.
Br.....	103.4	102	1.15	Restless.	Quiet all day.
Mil.....	104.6	99.4	1.20	Very restless.	Slept three hours.
Mil.....	99.4	98.6	40'	Normal.	Normal.
Os.....	104.2	103.2	35'	Restless.	Normal.
O'Q....	104.6	102	1.15	Restless.	Normal.
Cl.....	105.2	101	1.45	Delirious.	Slept in pack.
Ru.....	105.4	100.2	2.40	Delirious.	Quiet.
Eu.....	107	102.2	2.20	Restless.	Normal.
Gr.....	104.4	102.4	1.10	Delirious.	Quiet.
Go.....	105	103.6	2.15	Restless.	Slept in pack.
Go.....	103.4	103	20'	Restless.	Still restless.
Go.....	103	101.2	3.10	Restless.	Slept in pack three hours.
Sw.....	104.4	102.6	40'	Delirious. Very restless.	Rested quietly.
Sa.....	105.4	104.6	1.20	Restless.	Quiet.
Tr.....	107	102	4.10	Very restless.	Slept in pack four hours.
Ch.....	105.4	102.4	3.15	Delirious.	Slept in pack three hours.
Le.....	104.8	103.4	1.00	Delirious.	Quiet.
Ga.....	102	102	30'	Delirious.	Rational.
Br.....	105.4	104	3.10	Delirious.	Quiet four hours.
Gr.....	102.8	102.4	2.05	Delirious.	Quiet for one hour.
Gr.....	102.6	103.6	1.30	Moribund.	Still delirious.
Gu.....	107	105.6	1.15	Delirious.	Rested quietly.
McF.....	105.8	103	2.30	Restless.	Slept in pack.

These data are necessarily incomplete. Notes were kept on a number of cases so treated, but they could not be made complete, for all officers and men were too busy to allow much time for notations.

Very truly yours,

W. C. Braisted,
Surgeon-general, U. S. Navy.

In *febrile cases* with high temperature but without insomnia the sheet is less wrung out in order to abstract more heat. Three single blankets are used for covering, as

above. Every ten minutes one blanket is removed. When the last is reached the patient's body is quickly cooled off by ablutions or affusions with water at 80° to 70° F. Such a pack is a useful substitute for tub-baths or other procedures. In several cases cited by Surgeon Old the temperature was reduced from 107° and 106° to 102° F.

In *chronic insomnia*, administered at bedtime, the wet pack is the most reliable hypnotic in the author's experience. He has seen in the Kaltenleutgeben Sanatorium of Professor Winternitz numbers of patients soundly sleeping, although the packs were usually given before 7 A. M., *i. e.*, for tonic or other effects. And in the Vanderbilt Clinic men who claimed to suffer from insomnia have fallen asleep amid all the noise of the room.

The patient is quietly returned to a warmed bed.

The Tonic Effect of the Wet Pack.—When defective tissue change is a prominent element, as in *diabetes*, *rheumatism*, *gout*, some disorders of the digestive apparatus, anemia and chlorosis, abundant clinical observation attests the value of the wet pack.

In *functional neuroses* the wet pack offers a means of allaying irritability, and if succeeded, as it should be, by a douche or other active mechanico-hydriatic procedure, it will refresh the nervous system, improve tissue change and the blood-making function, and invigorate the circulation. Thus, a combination of effects results which no other procedure is capable of furnishing, provided the patient's reactive capacity is satisfactory.

In domestic practice the wet pack may be followed in these and other cases by affusions at 70° to 75° F.

In *chorea* the necessary rest cure is greatly shortened if the patient receives a wet pack at 70° F. once daily, or if insomnia be present at bedtime. In the latter case gentle drying suffices. Not only does this procedure serve to break the monotony of the rest cure isolation, but the evanescent thermic excitation promotes appetite and assimilation, and the envelopment in the sheet, warmed by the patient, insures calmness and restraint. The

pack should begin with half an hour duration and be daily increased five or more minutes.

In subacute or chronic nephritis the wet pack at 70° F. is superior to the conventional hot blanket pack if the patient's reaction is good, which may be ascertained by gently drawing an inverted finger-nail over the chest and observing the red streak, a quick appearance of which denotes good reaction. Van Noorden and Groedel have confirmed my own observation of favorable effects if given once daily, always provided that reaction warms the sheet within ten minutes. The author has demonstrated to his classes that the hot blanket will cool off while the cool sheet will be warmed if the patient remains, as is customary, in the pack for an hour or more. Equalization between skin and damp cover is accomplished in a shorter time. The inferiority of the hot pack is obvious. While the latter may act symptomatically by increasing diaphoresis, the cold pack of long duration improves the renal circulation and is not as depressing as the hot pack.

For *insomnia of neurasthenias* the wet pack at bedtime is the hypnotic par excellence. It should in these cases be followed by gentle and rapid drying without disturbing the patient's drowsiness. The physician who will make cautious trial of this hypnotic agent will save himself much distress and the patient from becoming an habitué, for there is no condition more imperatively demands our best directed efforts.

THE WET COMPRESS

This procedure consists of the application of two or more folds of old linen wrung out of water at prescribed temperatures and covered with flannel. It is most frequently used on the throat, around the chest, over the abdomen, around the trunk, and over the heart.

The Throat Compress.—Prepared by cutting two strips of linen 3 inches wide and long enough to reach from beneath one ear under the chin to the opposite ear (Fig. 13). A piece of flannel $\frac{1}{4}$ inch wider is required, but of



Fig. 13.—Throat compress: *a*, Flannel; *b*, linen.
(Courtesy of Presbyterian Hospital.)

sufficient length to overlap on top of the head. A slit is cut through the flannel, after measuring, to permit the

passage of the ears. The linen is wrung out of water at 60° F. It is placed upon the flannel and applied as is

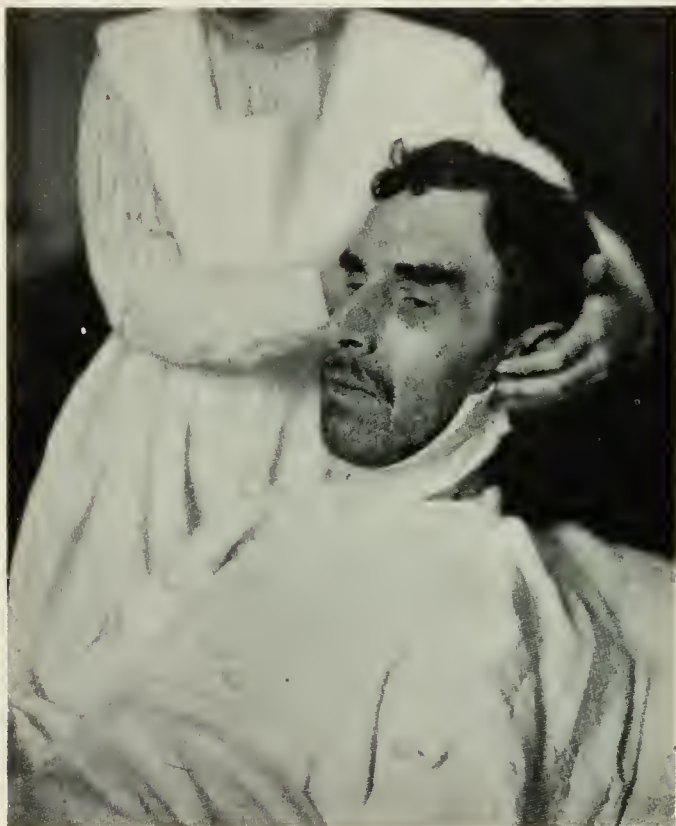


Fig. 14.—Throat compress: correct application of wet linen.

shown in Fig. 14. The flannel is tightly drawn together on top of the head and secured by safety-pins (Fig. 15).

The chief object of the throat compress is to cause a stimulation of the cutaneous nerves and vessels, and by

subsequent warming of the damp linen to create a soothing vapor. A common error in this procedure is the wrapping of the compress around the throat and neck (Fig. 16), which defeats its object because it cannot be

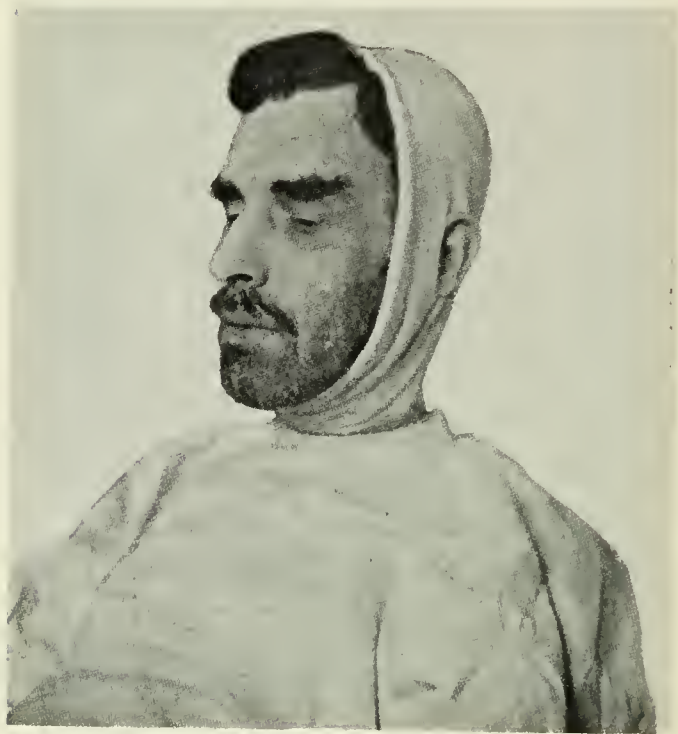


Fig. 15.—Correct application of throat compress.

snugly applied and becomes annoying by reason of its mobility.

Therapeutic Indications.—In tonsillitis and laryngitis this compress is repeated every hour, a fresh one being in readiness before removal.

The **chest compress** is prepared by cutting two or three pieces of old linen in the shape indicated (Fig. 17) and of sufficient size to fit the entire chest from the clavicles down to the umbilicus, with arm-holes in the region of



Fig. 16.—Incorrect application of throat compress.

the axillæ, made by measuring from one axilla to the other, sufficiently deep to allow the upper edge of the compress to reach above the clavicles and admit of the junction of the flaps thus formed on each side, to cover the shoulders, by pinning them to the anterior portion.

Two such jackets and two pieces of closely woven thin flannel of the same shape, but an inch wider and longer, should be provided and fitted to the patient. One of the linen compresses is rolled up and soaked in a basin of water at 60° F. and wrung out so that it remains quite damp without dripping. The flannel is now spread out upon an even surface and the wet compress put upon it, so that there remains an edge of flannel about 1 inch wide all around. Both are rolled together half-way.

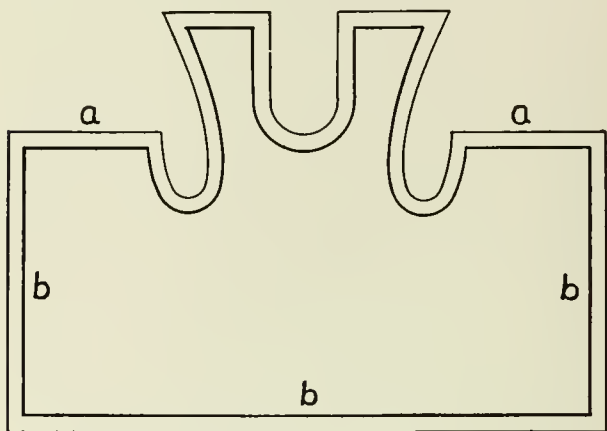


Fig. 17.—Chest compress: *a*, Flannel; *b*, linen.

While the patient is gently turned upon his right side (Fig. 18), with the precaution of not allowing any exertion on his part and the arms raised above the head, the compress is so placed upon the bed that the rolled part lies in close proximity to the left side of the patient and the lower edge of the left slit is under the left axilla. Now the patient is quietly turned upon his back, and his arms are raised above his head so as to release the rolled-up portion (Fig. 19). The latter is now unrolled and both edges of the compress are brought forward upon the front of the chest, and are thus made to envelop the latter snugly. The

flannel cover, which has been allowed to lie upon the bed during the application of the wet compress, is now brought forward so as to cover the latter. It is secured by two safety-pins in front and one pin upon each shoulder. The arms are lowered, the flaps brought above the shoulders, and the patient is thus enveloped in a wet vest (Fig. 20).



Fig. 18.—Chest compress: preparing for application of wet linen.
(From lecture, International Clinics.)

As indicated above, this compress should be made to fit snugly when wrapped around the chest, to prevent chilling during vaporization of the water. On the other hand, it should not be so tight as to embarrass the breathing.

The compress should be changed about once every hour,

and the precaution previously mentioned, to have a fresh compress in readiness before removal, must be observed, in order to obviate needless exposure of the nude chest, which interferes with reaction. Another important precaution should be impressed upon the nurse, viz., to ascertain before renewal by inserting the finger beneath the



Fig. 19.—Chest compress: applying flannel cover. (Lecture at Presbyterian Hospital published in *International Clinics*.)

compress if it is thoroughly warmed, and to avoid renewal if the linen is cool. So long as the rectal temperature is above 99.5° F. the compress may be renewed every hour; when it falls below this point, it should be allowed to remain until dry, then removed when convenient, and discontinued until the rectal temperature again rises.

Thus a rotation is kept up every half-hour or hour, as the case may require, night and day, *unless the patient is asleep*. The water in the basin should be renewed each time, and the compress rinsed off in another basin before it is rolled up for soaking. In order to insure thorough cleanliness and prevent furuncles by furthering asepsis,



Fig. 20.—Chest compress complete. Appears like a vest.

two sets of compresses are required to admit of changing, and each compress should be boiled once in twenty-four hours, as in the other forms of this procedure. A very prevalent error is committed unwittingly by nurses in their commendable zeal for cleanliness, viz., the covering of the compress with oiled silk or other waterproof material. The latter would convert the wet compress

into a poultice—in surgery termed a wet dressing. Inasmuch as the chief aim of the wet compress is, first, stimulation by thermic excitation, then hyperemia by reaction, and it is desired to reduce the latter slowly by evaporation through the flannel for antithermic effect, the impervious covering would defeat the object. Unless nurses have been specially instructed, they will surely use a waterproof cover, especially over an abdominal or chest compress, for the purpose of avoiding dampening of the clothing and bed. This may be accomplished by placing extra towels, so as to absorb the excess of moisture above and below the compress site.

The *technic* of the procedure has been entered into with a detail that may seem needless. As will be shown later, these details insure precision, and upon their exact execution may depend success or failure. The physician should himself supervise the first application of all compresses, just as he should supervise the first bath in typhoid fever. A skilled nurse can apply these compresses with a minimum of disturbance.

There is need, too, of individualization. In the average case a temperature of 60° F. will be appropriate. Should the patient evince stupor or muttering delirium, a lower temperature should be adopted, and the chest should receive one or more dashes of colder water before renewal of each compress. The same procedure is indicated in bronchopneumonia, when the bronchi are blocked by secretions or cyanosis exists.

When in adynamic conditions the compress does not warm readily and the skin remains cool after expiration of an hour, the linen cloths should be removed and the chest wrapped in flannel alone until the skin becomes warm. Then the compress should be well wrung out of water at 60° F. and applied after gentle friction. Such a compress, if snugly applied, improves cardiac action, as evidenced by return of pink hue to the finger-nails.

A higher temperature than 60° F. may be used if there be much jactitation, insomnia, or excitability. In the

latter event great benefit will accrue from allowing the compress to remain two hours and wringing it less, thus converting the compress into a soothing fomentation that is not relaxing like a poultice.

The **abdominal compress** consists of a piece of linen in three folds, if thin, of sufficient size to reach from the sternum to the pubis and lap over on each side of the abdomen. This is wrung out of water at 69° to 70° F. and held in position by a flannel binder a little wider and long enough to reach around the body, the middle portion of which is placed under the patient and its end snugly secured in front by safety-pins.

When a change of this bandage is necessary the flannel is simply opened, the warmed compress removed, and a fresh one applied, the flannel again being secured. When the latter becomes so damp as to convey moisture to the bed clothing it should be changed. It is always well to keep two or more compresses on hand. Each compress should be boiled once a day for fifteen minutes to prevent septic furunculosis. An extra sheet folded several times and placed under the trunk of the patient is the best protection. A rubber sheet is objectionable because it conduces to rapid heating of the compress. This precaution applies to all compresses.

The **trunk compress** consists of a bandage of two or three folds of coarse linen, sufficiently long to cover the entire trunk, from the axilla to the pubis, and wide enough to reach around the entire body. This is wrung out of water usually of 60° to 75° F., snugly wrapped around the body, covered with another linen or flannel bandage, and secured by pins. These bandages are changed every hour, the part being washed with cold water each time before a fresh bandage is applied. Extra towels or a sheet are required to protect the bed. This is termed a half-pack.

The Antiphlogistic Compress.—For the purpose of cooling inflamed joints a compress moistened with water at from 50° to 60° F. may be applied, and covered with

thin flannel which is opened for renewal of the compress by dripping fresh water upon it. Useful for inflamed joints.

Cooling Deep-seated Parts.—The commonly prevalent idea that cooling applications made to the cutaneous surfaces penetrate deeply if sufficiently cold and prolonged is erroneous. The author is convinced that the heat-regulating machinery of the body, which is immediately called into action for the purpose of resisting the invasion of cold into the interior, frustrates the object in view. The application of ice-bags in pneumonia, pericarditis, peritonitis, gastritis, appendicitis, etc., is so universal that the author opposes this practice with great hesitancy and reluctance. Due consideration of the contradictory findings of various experimenters and the teaching of practical experience may convince the reader, as it has convinced the author, of the fallacy of the established practice. The *anesthetic effect* of a hot poultice or an ice-bag cannot be denied, but that external applications can affect the circulation of the lungs or appendix to any appreciable extent has been disproved. Intervening tissues supplied with warm blood preclude such a result.

Rationale of the Wet Compress.—The usual effect of cold upon the cutaneous muscles is at once produced; they contract by reason of the stimulus from the cold; the vessels are slightly compressed, the part is cooled, but very soon, according to the temperature of the water and the reactive capacity of the patient, an active hyperemia ensues—the tonic dilatation so frequently referred to above. Now the compress becomes heated by the afflux of arterial blood beneath it; the further dissipation of heat being inhibited by the non-conductive flannel covering, it accumulates underneath the compress, which gradually attains the temperature of the part—the dry covering preventing rapid evaporation. Thus heat is accumulated until the compress becomes dry if the application is snug—an important requisite; the vessels re-

ceive an active afflux of blood, local tissue change is enhanced. Repetition of the cold compress produces an alternating effect, cold succeeded by warmth eventually increases the quantity of blood circulating in the cutaneous vessels. Thus the deeper parts lying underneath the compress receive a sudden afflux of blood during the first impact of the cold compress, and when the cutaneous vessels dilate under the reaction which follows the vessels in the deeper parts are then again narrowed. This active fluxion between the vessels of the deep and superficial parts must exert a powerful influence upon the former, removing stasis and furthering absorption of inflammatory products, a theory which is borne out by clinical observation.

A compress wrung out of hot water (over 104° F.) would produce a primary contraction of the cutaneous vessels, which would be followed by their relaxation and loss of tone, while the underlying parts would become hyperemic. But in this instance the primary thermic effect upon the central nervous system would be almost nil, while the soothing effect upon the peripheral nerve endings would be decided, as is evident in the action of a hot poultice.

Both cold and warm compresses produce effects upon the composition of the blood in parts lying beneath them and upon distant parts, also upon their temperature.¹

Wet Dressing.—The wet compress covered by an impermeable covering, known in surgical parlance as “wet dressing,” which is retained for a more or less prolonged period over diseased parts, and is superior to the poultice by reason of its simplicity, capacity for holding antiseptics, and by its lightness, readily demonstrates the difference between a properly and improperly applied *wet compress*, and the capacity of modification possessed by the latter in adapting it to the therapeutic indications of the individual case.

There is no special advantage in applying hot com-

¹ Principles and Practice of Hydrotherapy, 3d ed., p. 152.

presses for revulsive purposes, because it is difficult to maintain their temperature. On the other hand, whenever revulsive action with a continuous tonic effect is desired, the cold wet compress, covered with dry flannel, is superior to all other applications, because it raises the cutaneous temperature in a physiologic manner—by reaction—to a point beyond the normal, and after each renewal causes a dilatation which results in an afflux of blood into the part. The colder the water within reasonable limits and the warmer the skin, the more active the reaction which follows. Only when purulent formation is imminent should the hot compress be preferred.

Therapeutic Indications.—The patient's *normal* sleep must never be disturbed. In *tonsillitis* and other inflammatory throat troubles the stimulating compress has been used effectively; not, however, as is ordinarily supposed, for the purpose of cooling the tonsils, etc., but with a view to producing a hyperemia in the tissues lying between the inflamed part and the compress, and chiefly by reflex action to render the affected part anemic.

The *chest compress*, described above, is not used by the author for cooling purposes; for reasons referred to he does not approve the application of ice or very cold compresses for hemoptysis or pulmonary hyperemia, as will be shown later. The stimulating chest compress, however, is useful in phthisis and pneumonia. Aside from the effects referred to in discussing the *Rationale* of all compresses, the chest compress causes a deep inspiration, and thus aids in filling the lungs with oxygen and expelling accumulated secretions. Evaporation from the gradually heated compress slowly goes on through the badly conducting flannel covering, creating a warmth around the chest which is comforting to the patient, allays cough and dyspnea, and thus contributes materially to that alleviation of symptoms which leads to recovery. In phthisis and subacute pulmonary affections and in chronic infiltration the chest bandages may be worn day and night; in most cases its use at night suffices.

Nothing contributes more to the reduction of temperature, relief of pain, and alleviation of the general malaise than do the chest compresses, containing just enough water not to permit its flowing upon adjoining parts. Such a compress may be renewed as the case demands, always after it feels warm to the nurse.

In *pneumonia* the chest compress is the most important remedial agent, if applied *when patient is awake* every half-hour or hour when the temperature is above 102.5° F., hourly if below, and removed when it falls below 100° F. The cold compress (60° F.) produces a deep inspiration; it contracts the cutaneous vessels, which rapidly dilate and soon form a soothing poultice differing from the old-fashioned warm poultice in being more cleanly, and in maintaining a tonic dilatation which aids the heart in propelling the blood through the contracted vascular area, which warm applications would paralyze by relaxation. One cause of heart failure will thus be removed by the half-hourly stimulus to the cutaneous arterioles, arising from the shock and subsequent reaction. That temperature is also reduced by the wet compress in pneumonia the author has repeatedly observed.

The chest compress produces not only a stimulating and tonic effect but also a calming influence upon the cough and softening of the secretions which adds immensely to the patient's comfort without the detrimental effects of opiates and expectorants. The process of equalization of temperature between the skin and compress is accompanied by the formation of moist vapor, which, being prevented from escaping through the non-conducting flannel covering, bathes the chest and probably penetrates, as has been shown in the physiology of the skin, through the latter and influences cell life and local circulation. The positive difference between the old-fashioned poultice with its impermeable covering and the properly applied compress with its flannel covering lies in the fact that the former lacks the refreshing and stimulating effects resulting from reaction after the cold

procedure, a difference which must inure to the advantage or disadvantage of feeble circulatory conditions.

Whenever the chest compress is to be discontinued, as when the patient is convalescent, the parts beneath it should be well rubbed with a cold damp cloth, followed by hand friction and warmer clothing, to maintain the local and general stimulation.

The *abdominal compress* has been found very useful in all febrile diseases, especially in typhoid fever, influenza, diarrhea, and dysentery. In these cases it reduces temperature, and by producing hyperemic conditions of the skin (contrary to the commonly accepted idea) it acts as a revulsive. Moreover, the soothing effect of such a compress is an invaluable therapeutic auxiliary in these trying cases, not infrequently preventing the necessity for anodynes, hypnotics, and antipyretics. For these purposes frequent renewal, about every hour, is required. The author has long ceased to depend upon intense cold applications (ice-bags) over the region of the appendix and other inflamed parts for aborting inflammatory processes or for checking internal hemorrhages (hemoptysis). They are delusive, as has been explained.

As a local anesthetic the ice-bag has been found useful, specially in appendicitis, in the early stage of which opiates should be avoided because they obscure the most important indications for surgical interference.

In many *chronic diseases* involving the intra-abdominal organs, be they functional or organic, a properly applied *Neptune girdle* (trunk half-pack) will be found of great value. Here the wet compress should be worn until it is nearly dry. In the various chronic gastro-intestinal disturbances of adults and children, which lie at the foundation of dyspepsia, diarrhea, and constipation, such a compress is very useful if worn day and night.

The **hot fomentation compress** demands a separate description. It consists of two pieces of old blanket, about 18 inches square, which are saturated with boiling

water, and thoroughly wrung out by means of a wringer. The latter may be constructed of a crash towel, to the upper and lower extremities of which strong sticks, about 25 or 30 inches long, are secured by stitching, so that their ends project on each side. This wringer is placed in a basin and the blanket pieces are laid upon it. Boiling water is now poured upon the latter until they are thoroughly saturated. The sticks are used for twisting the towel in opposite directions, so that not a drop of free water remains on the blanket compress. The painful parts which are to receive the hot fomentation are well anointed before the patient is snugly wrapped in a dry blanket. This accomplished, he is approached by the attendant, holding the twisted towel containing the hot, moist blanket cloths. These are laid aside until he has opened the blanket sufficiently to slip the hot fomentation out of the towel upon the affected part. This being rapidly done, the enveloping blanket is quickly closed. If the patient complains of the heat, he should be persuaded to bear it. The fact that the receiving part has been anointed and that the *hot water has been expelled* from the cloth precludes any danger of a burn. *That imperfect wringing, however, enhances this danger has been observed by the author, and should be constantly impressed upon the attendant.* In the beginning of the treatment it is well not to apply the compress too hot in order to inure the patient to higher temperatures gradually. The compress should be renewed or repeated every ten or fifteen minutes; three or four usually suffice to produce a vapor bath. After the termination of the fomentation the patient is gradually uncovered; successive parts are rubbed dry, and quickly washed off with water at 75° F. with friction; he is then again dried and put to bed. When accessible a jet or fan douche of 85° F. may be applied with great benefit. In domestic practice an affusion from a basin of water at 75° F. or lower, while the patient sits in a tub of warm water, is a useful substitute if followed by thorough friction.

In *sciatica* there is no home treatment approaching this simple procedure in efficiency.

Lumbago and intercostal or other muscular rheumatic affections are rapidly relieved by the hot fomentations, repeated every night. In recent cases two or four applications suffice to restore suppleness to the muscles and render motion painless.

The Precordial Compress.—The precordial region is covered with three or four layers of thin linen wrung out of water at 40° F. Upon this is laid a large ice-bag filled two-thirds with finely crushed ice. A flannel bandage around the chest holds the compress and cooling apparatus securely.

The author has adopted the practice of never permitting an ice-bag or coil to remain longer than forty minutes, and always to allow local reaction to ensue, requiring about an hour before reapplying it. Sloughing from prolonged application of an ice-bag has been observed by one of my assistants.

Rationale.—The cooling of the structures lying over the region of the heart doubtless exercises a reflex stimulus upon the cardiac nerve supply. The cardiac contractions become more vigorous, being evidenced by increase of arterial tension and filling of the radial artery, the pulse becoming more full and slow.

Therapeutic Indications.—The most favorable cardiac cases for the cold precordial compress are those in which the second sounds are weaker at the base than the first tone. This condition is often characteristic of Basedow's disease. Especially if the cautious, intermittent use of the ice-coil is accompanied by a milk or vegetable diet, and absolute abstention from meat, spices, and other irritating foods, improvement is obtained quickly in this disease.

In cases of functional arrhythmia or tachycardia, in enfeebled heart action due to loss of compensation, and in some cases of adynamia in acute disease the precordial cooling compress has proved in the hands of the author an excellent heart tonic. In his hospital practice this obser-

vation has been confirmed; not infrequently patients have been tided over serious adynamic conditions by the precordial cooling compress.

THE COLD FRICTION BATH

This is briefly termed "tubbing" by American physicians. It consists of entire submersion of the body, with the exception of the head, the chin barely touching the upper surface of the water. Since this procedure has been applied with notable success in the treatment of typhoid fever and other infectious diseases, a detailed description of the method and rationale demands attention.

The technic of this bath varies with the therapeutic objects we have in view, as will be shown. The cold tub-bath is applied as follows: In acute cases a tub of sufficient length (6 feet) and breadth to comfortably accommodate the patient, and filled to three-fourths of its depth with water from 80° to 70° F., as prescribed, is placed on chairs or stools near the patient's bed, if possible separated by a screen which prevents his being excited by the preparations. The tub may be partly filled in the bath room, to avoid disturbing the patient. The author has sometimes made a rubber hose connection with a nearby basin and once had an outlet made through a wall. Otherwise, buckets must be used with the least possible noise. Renewal of the water may be made so long as it is not soiled by the patient, every twenty-four hours. During the bath a double blanket is spread upon the side of the bed to be occupied by the patient when he emerges from the bath, the pillow being covered by a towel. Upon the blanket is spread an old linen sheet or table cloth (cotton is not so useful because it does not absorb water readily, and it is sometimes necessary, as will be shown, to let the patient remain in it without drying). Several hot-water bags or bottles are also prepared for the feet, which are usually cold after the bath. The patient receives a small cup of hot coffee

before he is undressed, and a light napkin is secured over the sexual organs. His face is bathed with ice-water, and, if too feeble to step into the bath, he is lifted into it by two assistants. With the greatest gentleness and least fuss he is lowered into the water. He gasps and shudders a moment or perhaps cries out. But gentle reassurance by word and deed, a calm demeanor, devoid of haste, and the absence of all actual force or argument to resist his natural desire to escape from the seemingly heroic treatment, will not fail to quiet his apprehensions. Friends or relatives must be kept out of the room, as their presence would increase the anxiety of the patient, and render him more resisting by their sympathy enhanced by injudicious and unavailing explanations. If an air- or water-cushion has been suspended from the head of the tub it will afford a good resting-place for the patient's head, and a large water-cushion ring makes a comfortable support for his nates. In the absence of a head support the nurse will hold it up with the left hand, while with the right gentle friction or chafing will be practised over successive parts of the body. This may be done also by an assistant, who in private practice should be a calm member of the family or a friend. Care must be taken that every part of the body (except the lower part of the abdomen) receives these frictions, which are regarded as of supreme importance by Ernst Brand, the originator of this method, in preventing chilling, collapse, cyanosis, and heart failure. The effect of the continuous gentle chafing is a suffused redness, which is in marked contrast to the previous death-like pallor of the surface, and demonstrates that the caliber of the superficial vessels is considerably enlarged. As this is being done in successive parts of the body we really manage to maintain a constant narrowing and dilation of the peripheral vessels, the former being accomplished by the contraction of the cutaneous muscular structures under the influence of cold, the latter by the friction and its attendant reaction. *Complaints of chilliness must not be regarded as an indication for re-*

removal of the patient from the bath, unless it be accompanied by decided chattering of the teeth; the former is voluntary and may be emotional, the latter is involuntary. A small pulse, together with a cyanotic or shriveled condition of the extremities, too, are regarded by the inexperienced as a warning signal to remove the patient from the bath. These symptoms may be due, it should be remembered, to the constricting action of the cold upon the skin, and need not be regarded as threatening *unless the face becomes cyanotic*. This, not being submerged, can only be rendered cyanotic by actual enfeeblement of the heart action, a condition which is exceedingly rare when the bath is administered with friction. That the small pulse is not an indication of heart failure will be evident to the reflecting observer from the fact that it is much slower and less compressible, having lost its dirotic character. For this reason bystanders, who may be easily alarmed, must be avoided, or, if their presence and assistance be needed, the true explanation of these symptoms should be given them ere they occur. The duration of the cold full bath depends upon the object in view, which will be treated under the proper heads. Several times during the bath, which usually lasts fifteen minutes, a basin of water at 60° F. is gently poured over the patient's head, around which a handkerchief folded like a bandage, 2 inches wide, is tied in a knot over the nucha. This forms a gutter, and prevents the surprise produced by cold water flowing over the face. If the patient is somnolent or delirious, cold water is poured over head and shoulders. The bath being finished, the patient is gently lifted out, the napkin covering the sexual organs rapidly dropped and replaced by a dry one, he is placed upon the previously prepared linen sheets, so that the upper edge extends above his shoulders to the nucha. He is now carefully wrapped as follows:

Being laid upon the sheet so that his nucha touches its upper edge, the sheet is brought around the body, a fold being pressed in between the arms and the body and be-

tween the lower extremities, the object being to prevent the approximation of wet body surfaces. The blanket is now wrapped around the patient. If the temperature has been high, above 103° F., in the rectum, the patient is allowed to lie in the sheet for five or ten minutes or longer if asleep; if the temperature is lower, he should be at once dried with a sheet and afterward with soft towels. In either case hot bottles are placed to the feet. Usually the patient who has been restless previous to the bath will fall asleep. Decided chilliness demands immediate drying.

This is the ideal bath designed by Ernest Brand for the treatment of typhoid fever. The technic has been rather minutely described because the author has seen it so frequently applied without friction, and otherwise improperly, and its success as a therapeutic measure depends upon its exact execution. The physician should always witness one or more of these baths, because faulty technic may cause failure. Indeed, its desuetude is due to the latter.

The gradually reduced tub-bath, erroneously regarded as milder by the inexperienced, fails to fulfil the therapeutic indications. Being necessarily longer, it really is not so easily borne as the steady temperature.

The **rationale of the full bath**, which has been chiefly applied in typhoid and other infectious fevers, is so exact and scientific that it must lend firmness born of conviction to the attendant who applies it with a clear understanding of its aims and capabilities.

What are the indications for treatment in a case of typhoid fever, for instance? Here we have a self-limited infective process which cannot be stopped or removed, producing the following conditions against which we must do battle if we would rescue our patient from its grasp:

The nervous system manifests decided and serious depreciation, as indicated by apathy, lassitude in the early stages, and later by delirium, tremor, etc. These manifestations are in typhoid and similar fevers the leading point of attack, and must, therefore, be the leading point of defense. From this adynamic condition originates an

enfeeblement of the circulation which, by its effect upon the peripheral vessels, not only disturbs heat radiation, and thus develops temperature elevation, but later in the disease gives rise to other most threatening conditions, failure of the heart, local hypostases, bed-sores, etc.

Since all the life-maintaining organs derive their working capacity from the nervous system, which receives the brunt of attack from the infection, the chief therapeutic indication is found in sustaining it by measures that do not otherwise handicap it.

The *rise of temperature* handicaps the heart and lungs. Respiration becomes hurried and shallow, bringing on cyanosis and death. The most dangerous element in persistent high temperature is its interference with sleep. Recuperation is inhibited, so that the patient's resistance is continuously undermined. Formerly elevated temperature was regarded as the chief lethal menace. This erroneous and fatal idea was difficult to remove, and is even now the cause of failure whenever the cold bath is used for reducing temperature.

The heart is driven to increased action by reason of failure of resistance in the peripheral vessels due to the infection, which also disturbs its innervation. Unless counteracted, hypostatic congestion interferes with the eliminating functions, leading to a fatal issue.

The muscular structures of the skin are relaxed under the general adynamia. Their support of the cutaneous capillaries and veins is diminished, causing dilatation of these vessels. To endow these muscular structures with better tone is a leading therapeutic indication not sufficiently recognized.

The friction bath below the skin temperature meets all these indications so completely that it has become the most dependable procedure in the management of infectious, and, for that matter, other fevers. The first contact of the entire body with cool or cold water incites the well-known effect on the inspiration—a gasp. If the water temperature is more than 10 degrees below that of

the skin, say 80° F., there is a so-called shock that arouses the central nervous system by reason of stimulation conveyed by the sensory tracts. Respiration, at first partly interrupted, deepens; the nerves become accustomed to the thermic stimulation. This good effect is furthered by friction over the skin. The patient brightens; he becomes more alert, his eyes regain the lost luster, apathy is removed. The constricting action of the cold water upon the cutaneous muscular structures is more important than hitherto recognized. It is most in evidence in the dartos of the scrotum, less so in the skin of the abdomen and back, and considerably in the extremities. This tonic contraction of the cutaneous involuntary muscle-fibers compresses the capillaries, which are really the only vessels permeating the skin. The latter becomes pale, but friction with the naked hand or a soft cloth stimulates the muscular structures, warming them somewhat, and their pallor is succeeded by redness.

The intense vasomotor stimulation resulting from the local thermic excitation increases ventricular contraction, sending the blood more freely into the capillaries and arterioles of the periphery. This results in removing stasis in the organs and mucous membranes and in repletion of cutaneous vessels. The increased flow of warm blood removes the muscular contraction, permitting these vessels to fill beyond their normal size. This plethora is, however, limited by the muscular and elastic structures of the skin. Thus is established a peripheral resistance which causes the heart to respond and removes more or less the existing circulatory handicap. It is the province of the physician to gage the capacity of the heart to react to the peripheral stimulation. For this reason affusions are useful in the beginning, or brief baths of the entire body. It must be borne in mind that always in the beginning of a fever the patient's responsive capacity is better than it is when the disease has depreciated vitality. Many failures are attributable to the use of very cold baths in prostrated conditions. It is better to proceed cau-

tiously. The author is convinced that the abandonment of this remedial agent is often due to disregard of this fact. In infections of brief duration, like grip or pneumonia, the full bath (tub-bath) of long duration is to be avoided, other procedures being preferable—wet compresses, half-packs, full packs, or affusions.

THE SEDATIVE BATH

This procedure, consisting of water several degrees above the skin temperature, is familiar as a household remedy. Although its technic is simple, it is rarely administered correctly, as will be shown. The patient is entirely submerged in the water except the head for ten to thirty minutes, the temperature varying from 100° to 102° F., never above the latter, according to therapeutic indications.

The rationale of this bath of a temperature from 100° to 102° F. has been studied by Max Schüller on rabbits which he had trephined. He found that if the body were immersed in warm water a decided contraction of the vessels of the pia mater ensued, and they remained contracted for some time. The well-known hypnotic effect of warm baths is thus explained. But, aside from this direct effect upon the cerebral circulation, there is a direct local effect upon the peripheral cutaneous nerve-endings. That the cerebral condition may be influenced by the state of the latter is a physiologic fact, clinically verified by the effect produced by the warm bath in cases of eclampsia or other conditions of excessive nerve irritability. Baths of this temperature (100° to 102° F.) reduce blood-pressure, but accelerate the pulse 8 to 12 beats. Respiration is at first hastened, but gradually becomes more slow, and inspiration is deepened.

Clinical Application of the Warm Tub-bath.—*Insomnia* is the chief therapeutic indication of this procedure. Much depends upon its temperature and duration, also upon the details. To neglect of the latter is due the almost invariable failure of this procedure, when the attendant simply directs the nurse to “give a warm bath.”

It is important to observe certain rules. If the water is below 100° F., it will not be soothing; if above 102° F., it will be stimulating instead of sedative. Provision should be made for wrapping the patient in a warm sheet when he emerges from the bath, otherwise the water on his skin will quickly absorb the room temperature, which is usually 20 or more degrees lower. Thus a stimulating action will result and the object of the baths defeated. One need but bathe one's face while immersed in a warm bath to obtain proof of this statement. Warm slippers and warm bedsheets should also be provided in advance by the use of hot-water bags. But the latter must be withdrawn before the patient enters the bed, because they may excite perspiration, which is fatal to the sedative action of the bath. The patient should be dried in warm towels, lying in bed.

Typhoid Fever.—In *acute diseases* prolonged immersion in water near the skin temperature merits more attention than it has received. The author's observations on the effect of such baths though favorable, in typhoid fever are insufficient to warrant a positive statement. They, however, amply bear out the observations of Riess, of Berlin, who reports over 809 cases treated in hospitals during a period of ten years, with lower mortality than that of other Berlin hospitals (8.5 per cent.). He claims that the duration of the disease is shortened 15 to 30 per cent. Insomnia and delirium are readily removed, cardiac action at first increased, is quieted, complications are less frequent, but temperature reduction is not pronounced. The technic consists in submerging the patient in water at 88° F. whenever the rectal temperature reaches 102° F., in removing him to his bed when it registers 100° F. He is again placed in the bath when the rectal temperature registers 102° F. The chief objection to this method would be the impracticability of supplying a sufficient number of tubs and nurses, but when the cases are not numerous, as in private practice, it deserves preference in private practice over the cold friction bath because of

its mildness, especially if the patient comes under treatment *after* the first week when the cold friction bath is so seriously opposed as to become impossible.

In the *pyrexia of infants* we have in the warm baths a potent means for reducing the temperature, assuaging pain, and relieving nervous debility, without materially interfering with any of the functions. In this day of facile resort to antipyrin and its congeners, the following large statistical evidence may be of value: In the *Jahrbuch für Kinderheilkunde* (xxxii, 142) Eroess reports the results of his observations upon the use of antipyrin, quinin, and warm baths in the pyrexia of very young infants: "Among 431 cases of fever during the first ten days after birth, 145 were of short duration, the remainder continuing for several days; in 184 it was continuous, and in most of the others irregular. In 44 per cent. it was attributable to gastro-intestinal disorder; in 34 per cent., to some disorder connected with the navel. Antipyrin was given in doses of from 1 to $2\frac{1}{4}$ grains, repeated, if necessary, in an hour. The effect was good, as was that of quinin. *Better results were obtained from the warm baths than from either drug.* The temperature of the bath was 95° F., duration, ten minutes; in weakly children, five minutes. Upon the general condition the result was very satisfactory. Sleeplessness and irritability usually disappeared, and the child fell into a quiet sleep, from which he awoke apparently improved. When the temperature is very high, a warm bath is an agent of the greatest value." The author presents this large statistical evidence, as it confirms his own observations. In older children it has long been my practice to bathe in water of 95° F., slowly reduced to 85° F., with constant friction, for eight to ten minutes, repeated every four hours. Parents have often resorted to this "reducing bath" before calling me.

Reference to an irrational application of the warm bath may not be out of place here. In the convulsions of children the practice of plunging the struggling patient into a hot bath, sometimes made more irritating with

mustard, is as reprehensible as it is antiquated. Indeed, before the excited attendants, who rush hither and thither for bath implements, succeed in placing the infant into it the attack usually subsides. It is this coincidence which has maintained the reputation of the warm bath in these cases. Chloroform inhalations are far more effective if the attack be prolonged. It behooves physicians to discountenance this irrational bathing, which but adds to the excitement and trouble incident to such occasions, without helping the patient.

In *acute nephritis complicating infectious diseases* we have the testimony of the bedside to the value of the warm bath (100° to 102° F.) prolonged to half an hour, succeeded by wrapping the patient in a hot sheet, placing him between blankets with hot-water bags to maintain perspiration. Such patients must be sometimes watched to prevent collapse, which may be done by bathing the face with ice-water. Such a daily bath prevents uremia in subacute nephritis.

This action upon the renal circulation is probably due to reduction of blood-pressure in the kidneys and the consequent dilatation of their vessels. Without being able to explain the rationale, the empirical fact is demonstrable that a warm bath of 100° to 103° F. is a means for sparing labor for the kidney. By friction in the bath and subsequent rest in bed the relaxing effect of the bath on the superficial vessels and consequent sense of coolness and malaise may be avoided. Small quantities of cold drinks and bathing the face with cold water during the bath are useful to promote diuresis and prevent relaxation.

In *anemia*, complicating obesity, warm baths to perspiration withdraw water from the system, which may be done surely, and be regulated by the power of endurance of the patient. The ordinary hot bath (102° to 105° F.) competes with the more energetic hot-air and Russian bath, in the favor of those who strive for sylph-like proportions.

In *cardiac affections* the warm bath is usually regarded

as contraindicated, but the injurious effects are often due to improper execution of the bath. It should not be of so high a temperature as to heat the blood; nor should the patient dress in the room in which he has bathed, and which contains much moisture; nor should he make any effort in drying or dressing himself, leaving these to an attendant. If the latter is not available, the bath should be avoided. With due regard to these precautions, the warm bath is an excellent remedy to regulate cardiac action, and a method of saving labor for it, which has a great field, because it may be continued indefinitely.

An avoidable danger from the bath above 101° F. in cardiac insufficiency lies in its action upon the skin. The perspiration is greatly increased, the epidermis becomes succulent and gives off watery vapor; hence, there is a tendency to cooling off after the bath which may amount to a sense of chilliness. A rapid contraction of cutaneous vessels takes place. Thus, while it is our desire to relieve the heart, these decided variations in blood-pressure make an increased demand upon it. If, to avoid this, we carefully cover the patient, we incur the danger of fixing upon the cutaneous surface a layer of air which is saturated with vapor, which maintains the dilatation of the cutaneous vessels, and justly inspires the patient with the fear of taking cold. The tone of the vasomotors is diminished in these persons. Under normal conditions the vasomotor system provides for the correct division of blood in the whole body, preventing excessive contraction as well as dilatation. This equilibrium is disturbed by the warm bath, and a certain period is necessary for restitution of the normal tone of the surface vessels. In the healthy heart a cold affusion readily promotes the latter. But this cannot be regarded as a quieting procedure in abnormal cardiac conditions, and is only advisable in persons having vigorous hearts. Hence, it becomes important that the patient's cutaneous vascular tone be restored gradually. This may be done by gradually mopping the skin with warm cloths. This may seem

a trivial matter, but just such trifles render treatment effectual or harmful. Moreover, too active friction should be avoided in these cases, and woollen clothing should be worn. The latter not only protects the skin, which has been rendered tender and sensitive by the warm bath, but encourages by its roughness a certain amount of hyperemia, which is beneficial in diminishing cardiac labor. In advanced conditions of cardiac disease still greater care is necessary in the use of warm baths. *So long as there is no venous stasis, it may be used with advantage.* This may serve as a general rule.

Locomotor Ataxia.—In this obstinate and unsatisfactory disease the large number of medicinal agents recommended demonstrate our therapeutic helplessness. We must agree with Professor Leyden, who says that, while medicinal agents only serve to infuse hope into the desperate patient, *warm baths belong to the most important therapeutic methods in tabes*, and their correct and careful application is of the greatest importance. While they cannot be credited with curing the disease, they produce a beneficial, quieting, tonic influence. Patients must be warned against too great numbers of baths and against excitement from too high temperatures, or strong salt or CO₂ ingredients. The baths should be given with the greatest care and comfort, to avoid taking cold or being otherwise injurious. The temperature should be guided by the individuality of the patient (95° to 100° F.), and the duration should be five, ten or twenty minutes, according to the effect which may be expected to manifest itself in improvement of strength, calming of pains, and mild excitation of the sensory nerves. The latter may exert a favorable influence upon the degenerative process, and effect its cessation. Simple warm baths, without any or with very little addition, are most appropriate in the initial stages. Vapor baths, though useful in these, are objectionable in the chronic stages. A warm bath room is essential.

From personal experience the author can corroborate

these wise directions of Leyden regarding baths in tabes, and they apply with equal force to other chronic degenerative nerve lesions. The too frequent prescription "Take a warm bath" must be avoided. The author has observed a favorable action in the general vigor of the patient from douches of 18 to 20 pounds pressure and duration of one or more minutes and temperature rising daily one or more degrees, beginning at 102° F. He has reached 120° F. on the back. Cold douches are to be avoided.

THE HAMMOCK BATH

This term is more appropriate than those in vogue—"continuous bath," "permanent bath," "prolonged bath," etc.—because whenever the latter is desired a hammock arrangement is required to prevent the patient lying upon the hard tub bottom.

The preparation of such a bath requires some skill. A large tub is arranged so that the temperature of the water may be maintained at a comfortable rate. This may be done by connecting the bath with the hot and cold water supply pipe, and a thermostat to hold the temperature steady. I insist upon a mercurial thermometer to indicate rapid changes in the water temperature, which the most perfect metallic thermostat cannot do. For extemporaneous purposes in the home, suspending a strong sheet within the tub in the shape of a hammock; the sheet being secured to the edges of the tub by wet clothespins, and placing a rubber pillow (Fig. 21) under the head of the patient, enables him to lie comfortably and to change his position. When this type of bath is to be used in institutions a special arrangement is necessary, permitting of rapid outflow of feces or urine. A cot should be placed near the tub, on which the patient may spend part of his amphibious existence. I find the arrangement of three small rooms, the middle one for the tub, the others with beds for rest, economical, since two or more patients may use the tub in succession if the duration is less than twelve hours.

The tub should be covered with a blanket and rubber sheet, which are supported by light bars lying across the edges. The temperature of the water should be agreeable to the patient (88° to 100° F.), the duration of the baths brief at first and gradually prolonged, and mostly omitted at night. The skin will become puckered and may peel at first. This effect may be prevented or modified by



Fig. 21.—Hammock bath. (Courtesy of J. L. Mott Co.)

anointing the patient before the bath with mutton-suet or lanolin, when he soon becomes accustomed to the change.

In *cerebrospinal meningitis* the hammock bath has been found useful by the author in 2 desperate cases. It deserves more attention.

In *acute maniacal cases* the hammock bath is so universally applied that it needs but to be mentioned in this

connection. Since Petersen introduced it in this country it has become a standard procedure among alienists.

In *extensive burns* the hammock bath has proved of great value. Even in cases which succumb, it affords great relief if the water at 100° F. is saturated with bicarbonate of soda.

In *chronic cases* the hammock bath has been successfully used in pemphigus, in paraplegias of the lower extremities, paralysis of the bladder or intestines, contractions and reflex spasms in affections of the spinal cord, and eccentric pains in the extremities.

General hyperesthesia and cerebral excitement and delirium, connected with chronic meningitis and brain tumors, obtain great relief.

Inoperable cancer and artificial anus offer a wide field for its action.

In large abscesses, suppurating wounds, gangrene, and in tuberculosis of the bones and joints these baths will prove a boon to physician and patient alike. *They merit more frequent adoption in many desperate conditions that are now practically abandoned to their fate.*

Arthritis Deformans.—In an excellent paper in the Medical Record, 1915, Dr. Saul Danzer reports a series of cases treated under my direction in the Montefiore Hospital. He states, "It was remarkable how quickly patients felt relieved when placed in the tub; even the most advanced cases showed improvement. Out of all of these cases at the Montefiore Home and Hospital in only one case can we say definitely that no improvement resulted, and in this case treatment had to be suspended because of the general irritability. In many benefit was noticed after the second or third bath.

"Patients who for years had to take aspirin or some other form of salicylic acid to quiet their pains and give them rest could get along quite comfortably with no medication at all. This was already a gain, because we were dealing with the most advanced and desperate cases of the disease. Some patients were relieved only while

in the bath, while in others the improvement was more lasting.

“Joint Motion and Muscular Rigidity.”—Very early in the treatment we noticed that the patients began to move joints that were comparatively stiff before. This was due both to the relief from pain, as previously described, and also because of the muscular relaxation produced by the warm water. A remarkable case was a man suffering for about twelve years, who had not walked for the past three years, suffering from an acute exacerbation of a chronic nephritis. After three baths pain was relieved and he began to move some of his joints. After ten baths he walked without the help of a cane, a feat which he had not accomplished within three years.

“Paralysis Agitans.”—In this condition, as is well known, the patients complain of paresthesias (especially burning sensations) along the back, muscular tremor, and rigidity. Our routine medication was hyoscin, which in some instances had to be given thrice daily in order to obtain relief. When the bath treatment was begun all forms of medication were stopped, and patients who for years would crave their hyoscin could do without it very well.

“The paresthesias were the first to yield. As a rule, the greatest relief would be obtained while in the water, with a return of some pain afterward, while in others complete improvement resulted for the time being. Muscular rigidity was also lessened, thereby giving more motion to the joints. The tremor was also diminished while in the water.”

The duration of the hammock bath varied in these cases from five to sixteen hours.

Intractable cases of articular and muscular rheumatism and sciatica frequently improved. This is a confirmation of the results obtained in the mineral pools of Baden, Leuk, and other resorts where patients practically live in the pool. I should not regard such cases as hopeless until these baths have been properly used at home. Great

trouble, annoyance, and pecuniary outlay would be saved by rigging up a hammock bath at home or in an institution.

THE CARBON DIOXID BATH

The author has hitherto regarded mineralized waters as being outside of the scope of a work on hydrotherapy, because their action when externally applied is due only to the temperature conveyed by them to the skin. *The mineral elements of spring-water are not absorbed through the skin.* Since, however, gases have been definitely ascertained to enter the blood through the skin and carbon dioxid has earned a well-merited reputation in one of the most serious types of disease, those of the heart, the author offers the following rationale of the action of CO₂ baths, which differs from the conventional one, and presents a clear basis for our therapy.

The great repute of the waters of Bad Nauheim in heart diseases has led to artificial imitations. The latter are of service when they approach the natural waters in composition and technic of application.

These preparations have, as a rule, been unsatisfactory for reasons set forth in this chapter.

Many otherwise well-informed physicians do not regard the addition of salines, contained in the Nauheim waters, as essential, since carbon dioxid is the chief characteristic of these waters and they have obtained "good effects" without these salines. The writer hopes to make clear the great difference in the action of these waters with and without the salines, and the superiority of the natural CO₂ waters over the artificial in *cardiac diseases*.

It will also be shown that the claim that the stronger the supersaturation with CO₂, the more useful are these baths, is sustained neither by physiology nor clinical proof.

I would not venture to doubt that good effects may be obtained in other diseases than cardiac from carbon dioxid baths without the addition of salines. My claim is that

vastly better effects from the latter are positively demonstrated in cardiac diseases by the clinical experience of the best physicians in all countries, who have sent their heart cases to Nauheim and made this place a Mecca for these sufferers, and which has caused these waters to be closely imitated for use at home.

That the strongest CO₂ supersaturation offers the best results is absolutely disproved by the fact that while Homburg, Kissingen, and other springs offer from 15 to 25 per cent. more CO₂ supersaturation, Nauheim has for forty years been the resort par excellence for heart cases. No larger clinical demonstration is known in any disease.

The rationale of the action of CO₂ baths has hitherto been unreliable, varying greatly among the best authorities. Without discussing these theories, I venture to offer the following established data:

1. The accumulation of blood in the extensive cutaneous area withdraws a large quantity from the interior circulation and to that very considerable extent diminishes the labor of the heart by reason of the *vis a fronte*. This is the chief advantage of the hyperemia induced by the action of CO₂. It does lighten the burden of an insufficient heart. Other cutaneous irritants would accomplish the same object, but they have the disadvantage, *e. g.*, mustard baths, of hyperemia continuing for a more or less definite period succeeding the bath; while hyperemia from CO₂ bubbles disappears quickly after the termination of the bath. It is obvious that this hyperemia would handicap the heart if it persisted. Happily, it is accompanied by the following phenomena, which the author regards as paramount:

2. CO₂ is absorbed through the skin; entering the blood it acts as a stimulant to the respiratory center, increasing the inspiratory volume, without the depreciating action involved in exercise.

3. That the absorbed CO₂ stimulates involuntary muscular fibers is a well-known physiologic fact. I have demonstrated by experiments at Nauheim and Saratoga

its effects on the skin and muscle-fibers, which are distinctly contracted in the CO₂ bath.

4. Especially does this stimulating action inure to the smooth muscles of the vascular system and the heart, increasing tonicity and enhancing its contracting power. Proof of such action is found in the fact that animals dying from CO₂ poisoning present firmly contracted hearts (overstimulation).

The above-mentioned characteristics render obvious the superiority of the Nauheim waters over those of Kissingen, Homburg, and others in cardiac diseases.

Experiments in the Erlangen Clinic by Dr. Winternitz (not the Vienna hydrotherapist) have established beyond cavil:

(a) The CO₂ enters the skin from a bath containing the gas, with 1 per cent. sodium sulphate and carbonate.

(b) Absorption is more rapid when 2 to 3 per cent. sodium chlorid is added to the bath.

It was ascertained that in such a bath there occurs a decided increase of the respiratory volume (1½ liters), and that this is a specific action of the CO₂ baths which is absent in the case of other skin-irritating baths, even when they increased oxidation, as in mustard baths. The cause of this enhancement of the respiration is found in the excitation of the respiratory center by the absorbed CO₂. That the respiratory frequency was diminished and the inspiration deepened had been previously observed by others.

Experiments made, under my direction, by the official chemist of Saratoga Springs demonstrate other advantages of the chlorid of sodium addition to the CO₂ bath; viz., the addition of the salines to the artificial CO₂ bath "seems to make the water retain the gas better and therefore improve its supersaturation, and there is far less loss of CO₂, only 1 to 2 per cent. of gas during a ten-minute bath."

These reliable data must set at rest all further disputes over the value of the salines in the Nauheim waters, for

they show that absorption of CO_2 is furthered by them and escape of CO_2 is prevented by them.

Upon these facts I have constructed the following rationale of the Nauheim bath:

1. In the saline medium CO_2 enters the blood by rapid absorption. Here the chief action of this water is direct stimulation of the unstriated muscular fibers of the arterioles, arteries, and heart, improving the blood flow and preventing stases, which are the lethal factors in cardiac cases.

2. CO_2 being the natural hormone of the respiration, the latter is greatly enhanced, thus furthering more complete oxygenation and removal of venous blood. The enormous benefit accruing to the intrathoracic circulation is self-evident, since the lungs form the natural reservoir of the heart and aid its muscular efforts.

3. Stimulation of the unstriated muscular structures of the skin produces a constricting action similar to but milder than that produced by plain but colder water. This constricting of the skin offers another mild but positive resistance to the flow of blood in the large cutaneous area, with the result of enhancing cardiac energy.

Through the combined effect of all the elements furnished by the absorbed CO_2 baths, as described above, and a mild resistance at the periphery, which impels the ventricle, already stimulated by absorbed CO_2 , the blood is propelled with more energy to all the outlying districts. This moderate training of the heart once a day, though for only a short period, appears to be productive of salutary conditions in the entire vascular system, chiefly by increasing compensation, for which Nauheim has become famous.

This explanation of the rationale of the Nauheim bath is much more reasonable than that of a specific or occult effect from the CO_2 , and demonstrates that the superiority of the Nauheim waters in heart diseases over those of Homburg, Kissingen, Marienbad, and others is due to the presence of sodium chlorid in such quantity that it aids in the absorption of the CO_2 . Professor Groedel has objected to this theory on the ground that

there is already too much CO_2 in the blood of cardiac cases. This has not been proved. The cyanosis in these cases is due to the great diminution of oxygen content. The latter is certainly increased by the stimulation of the respiratory centers which enhances the amplitude of the respiration.

Comparison of Natural and Artificial CO_2 Baths.—

Among the disadvantages of the artificial CO_2 bath are: (a) The artificial gas presents larger bubbles, and is, therefore, locally more irritating. This produces a hyperemia, inhibiting to some extent absorption, which may be advantageous when it is used for neurasthenia, etc. (b) The artificial gas escapes more easily, as proved by the layer of air above the surface of the artificial CO_2 bath containing 17.25 per cent., while the air above the natural CO_2 bath shows only 0.89 per cent. The latter is readily explained by its having been in age-long solution under pressure with the deep springs. The Erlangen experiments show that in an artificial CO_2 bath absorption begins after ten minutes. It is probable, therefore, that very little CO_2 is absorbed during the conventional bath with artificial CO_2 of six to ten minutes unless sodium chlorid is added.

(c) The percentage of gas in the artificial water is uncertain, depending upon the size of the tub, which is rarely measured, and reliability of chemicals; whereas in the natural CO_2 water in Saratoga, Nauheim, etc., the gas, having been in age-long contact with the water, is received by the skin in a definite percentage, furnishing an unvarying action, which is reliable for therapeutic purposes, whether the tub is small or large.

There cannot be any doubt, therefore, of the superiority in therapeutic effect of the natural carbonic acid water over the artificially prepared in *cardiac diseases*.

It must always be borne in mind when preparing a Nauheim bath, whether with artificial or natural CO_2 water, that the sodium chlorid solution (1 pound to 5 gallons equals the average Nauheim water content) must

be dissolved and poured into the tub *before* the carbonic acid water flows into it; otherwise, if reversed, the chemical action will be too active and rapid, with the effect of driving off the CO_2 . This important fact was pointed out to me by Mr. Herbert Aut, the state chemist at Saratoga Springs, in my effort to convert the latter into an American Nauheim.

The plan of the Nauheim doctors, beginning with a saline bath at 94°F. , eight minutes, succeeded by a rest of one hour, and following this, every other day, with the progressive increase of CO_2 of 25, 50, 75, or 100 per cent. is worthy of being imitated, since these men have had a very large experience.

If dyspnea and other manifestations are relieved, the temperature of each bath may be reduced gradually as far as 86°F. and the full salines and CO_2 given. The number and frequency of the baths should be arranged entirely in accordance with the effect of each partial series, ascertained by a report of the nurse or, better still, by the physician himself. *The prevailing mode of ordering a series of eighteen baths is unscientific and unjust to the patient.*

If the cardiac insufficiency be more recent, or compensation appears to be initiated, the full strength of the saline and CO_2 bath may be administered for three baths at 93°F. , and afterward each bath reduced in temperature, 80°F. being the limit, and the duration increased up to twelve minutes, omitting the third day.

In *uncomplicated mitral insufficiency*, if there is no cardiac muscular degeneration, the temperature of the bath may be reduced every other day until 86°F. or less is reached, according to the effect upon the pulse and general manifestations. In cases of aortic or mitral stenosis, or if there is much fibrillation, the temperature should never go below 90°F.

If there is no disturbance of compensation, namely, if palpitation or slight dyspnea ensues only on decided or prolonged exertion, or when ascending stairs, one may begin at once with the combined CO_2 and saline bath, and

advance every other day up to the strongest baths at a temperature of 90° F. and duration of ten minutes, but not exceeding fifteen minutes. Only well-ascertained tolerance after each of these baths would warrant proceeding to lower temperature, and this with great caution, but with a shorter duration, not exceeding ten minutes.

Attention should be paid always to the general manifestations following these baths. A sense of prolonged fatigue and loss of sleep indicate that the bath is probably too intense.

In *so-called fatty heart* and *so-called weak heart*, manifesting themselves by a feeble compressible pulse of 80 or over, or increased considerably by ordinary exertion, one may readily proceed from the mildest to the strongest CO₂ bath with intermissions, raising the duration up to fifteen minutes, and lowering the temperature to 85° F. by degrees for each bath.

In *arteriosclerosis* the therapeutic indications are conditioned upon the presence or absence of increased blood-pressure and high pulse tension. In the latter cases the bath temperature and duration may be gradually increased to a point at which results appear to be favorable, always being ready to recede on the appearance of unfavorable manifestations. When there is high blood-pressure, however, great caution is necessary, and it is well not to allow the temperature to go below 95° F.

In *true angina pectoris* Nauheim baths must be ordered with extreme care.

Angina pectoris of the *so-called nervous or functional* type requires gradual neurovascular training, beginning with baths of five minutes at 93° F., and diminishing the latter in each bath as far as 85° F. without salines.

The most favorable time for the bath is in the morning, about two hours after a light breakfast. Patients should endeavor to be quiet in the bath. They should be dried gently, without friction, with warm linen sheets or towels, and rest in bed in a well-ventilated room one or two hours after each bath. A fairly strong patient

whose pulse is not easily excited may walk slowly to his lodgings, and there take a rest, but in the majority of cases it is advisable for the patient to ride in a chair to the hotel, and in a severe case he *should not leave the bath-house* without resting at least an hour. The period of rest is the time for the physician to see him personally, if possible, in order to note the effect of the bath.

The same rule applies to the artificial Nauheim bath.

The Schott resisting movements aid in the enhancement of respiratory amplitude produced by the CO₂ saline bath.

A reliable guide to the beneficial or other effect of the bath is the condition of the pulse, which should be reduced in frequency and somewhat increased in tension in uncompensated or imperfectly compensated patients.

When CO₂ baths are prescribed in other maladies, neurasthenia, etc., the sodium chlorid is unnecessary, and may be injurious, because it promotes absorption of the gas, which may prove too stimulating in excitable cases.

HYDRIATRIC INSTALMENT

THE procedures described above may be effectively executed in the home of the patient or in a hospital ward.

We come now to procedures which demand a special instalment and apparatus. Before entering upon the discussion of their technic, rationale, and therapeutic uses, the instalment required will be described.

For many years the author has been frequently consulted by hospitals and other institutions on the installation of apparatus and the manner of planning the "lay out." It has been his unfortunate observation that some architects and many plumbers have but too often followed their own ideas and inclinations, resulting in interference with correct administration of procedures, and in considerable outlay for remedying their faulty instalments.

In order to avoid these in the future the author proposes to offer examples, drawn from work of the most prominent architects in the country, after describing in the following chapter the ideal "lay out" for small and large institutions.

LOCATION FOR HYDROTHERAPEUTIC INSTALMENT

The rooms chosen for this purpose should have a southerly exposure. If, as is often necessary, they are located in the basement of the building, the windows must be above the ground level, so that a large portion of the space may be open to sunshine and easy ventilation, which are paramount in the furthering of reaction; this fact is usually disregarded by the inexperienced.

The more or less antiquated architecture so common in many European health resorts—their lofty ceilings, spacious salons, marble, or other columns—may add elegance to the patient's environment, but they detract from his reactive capacity. There is no objection to these esthetic

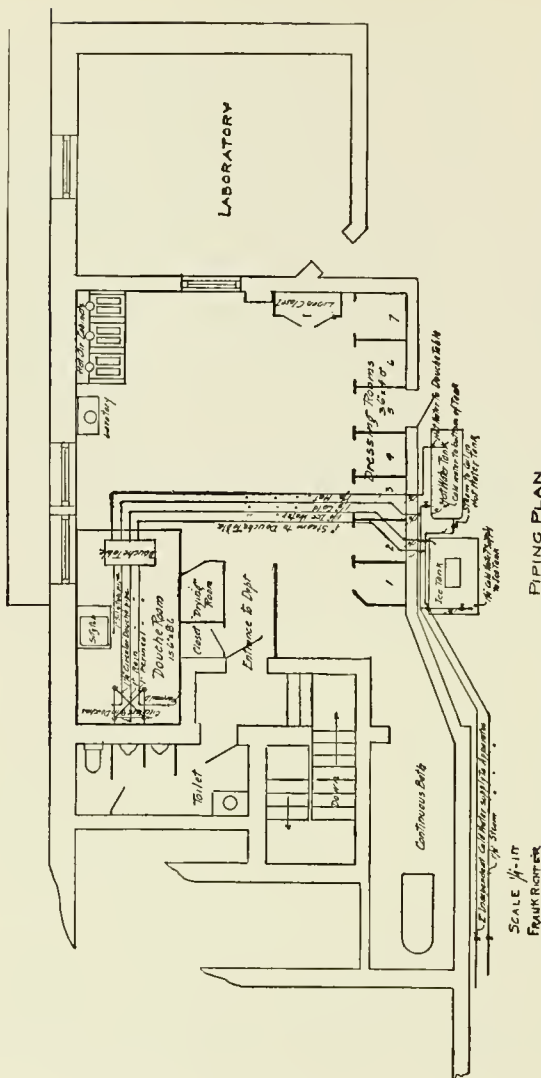


Fig. 22.—This piping arrangement functionated perfectly for over ten years, but when the heater demanded renewal, the architect connected the hot-water supply of the douche table with the main supply of the building. The result is absolute unreliability of temperature which will doubtless be remedied.

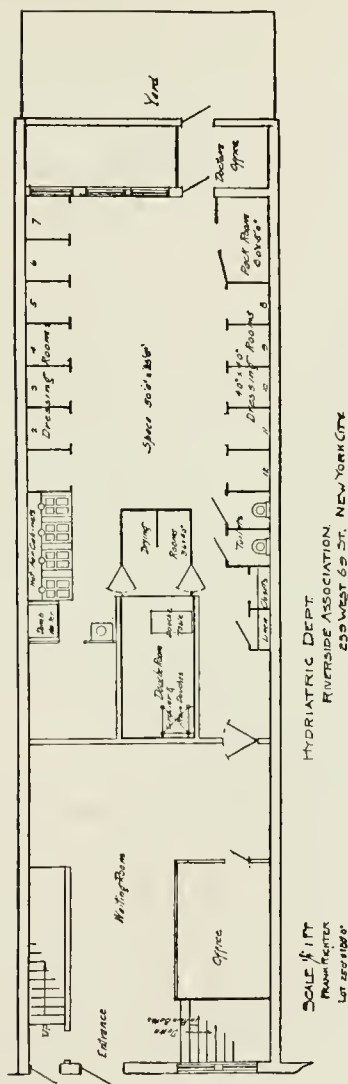


Fig. 23.—Outlines the arrangement of the Hydratric Department of the Riverside Association, in which from 50 to 150 patients daily received treatment for many years. The building was originally constructed (but never used) for a stable. The basement was used as a public (cleansing) bath.

constructions in the waiting-rooms, but the douche room or place for other procedures should be of smaller dimensions and less ornamental, yet not liable to overcrowding.

As an illustration of how small a space may be perfectly adapted for this purpose, the Hydrotherapeutic Department of the Vanderbilt Clinic may serve a good purpose. The plan here outlined (Fig. 22) explains itself. The waiting-room for patients is not included in this sketch, being on the floor above (Fig. 23).

The walls of the douche room of the Vanderbilt Clinic are constructed of tongue-and-grooved boards supporting Italian marble slabs 8 x 4 feet; ceiling is also of Italian marble; the floor is formed into a cement basin 4 inches deep with 1 inch fall to the water exit, over which a wooden floor of slats 2 x 4 x 1 inch thick is laid in sections, so that they may be removed for drying or repairs. It is a very common and serious error not to provide a wooden slat floor, because a cement, asphalt, or tile floor is cold, and the water which flows from the patient's body forms a puddle that often chills the feet and prevents reaction. The slatted floor favors reaction because the feet do not stand in water and wood is less chilling. A cabinet 4 x 6 feet is provided at the entrance of the douche room, in the floor of which is an extension of the douche room floor, also slatted; here the patient dries before returning to the dressing cabinet.

A number of dressing cabinets are constructed with wood partitions 4 x 4 feet, with a cloth curtain in front and a stool and hooks for clothing within.

If architects and plumbers will adhere to this outline, and, unless they have had previous experience in such construction, refrain from venturing upon modifications, they would save much outlay for changes that are certain to be demanded later when patients begin to be treated and great injury to the cause of hydrotherapy. Examples to illustrate this statement appear in these columns.

THE DOUCHE TABLE

The douche table is placed opposite the circular douche, 12 feet from the wall of the douche room. The patient may stand just within the circular douche, so that he may steady himself by grasping the right and left anterior posts of the latter. If the patient stands less than 10 feet from the douche table the return spray may strike the doucher if the water pressure is strong. If the distance from the douche outlet to the patient is more than 12 feet, the stream would, in the average instalment, be too feeble to produce reaction. The author had occasion to demonstrate these facts in one of the Reconstruction Hospitals, in which the distance was 16 feet. The patient, though not feeble, showed poor reaction under 20 pounds pressure. The finger-nail test indicating good reaction, he was placed 10 feet from the douche table, with the result that reaction was good. This incident is mentioned to demonstrate that failure may be due to imperfect instalment, which is easily prevented.

The *douche* or *control table* (Fig. 24) is supplied with a thermometer, clock, and pressure gage. It was devised by the author twenty-five years ago, for the purpose of insuring precision of temperature, duration, and pressure of the douche. The rationale and therapeutics of the latter will be presently discussed. It was built and improved under my guidance by Mr. Frank Richter, and has served the purpose so well that a plan and specifications are furnished for the benefit of architects and plumbers (Fig. 25). The nozzle should be of metal connected by the shortest possible rubber hose with the water outlet, in order that the nurse may be forced to hold the metal nozzle in the right hand when administering the douche. Mr. Frank Richter has recently devised "a hose" made entirely of metal (Fig. 24). The latter enables the attendant to discover sudden changes in the water temperature while the water is flowing, if the thermometer is not closely watched by a careless operator. A tested mercurial thermometer is absolutely necessary; no other

is correct. Opposite the douche table the circular douche is secured (Fig. 26). The author has retained this design-

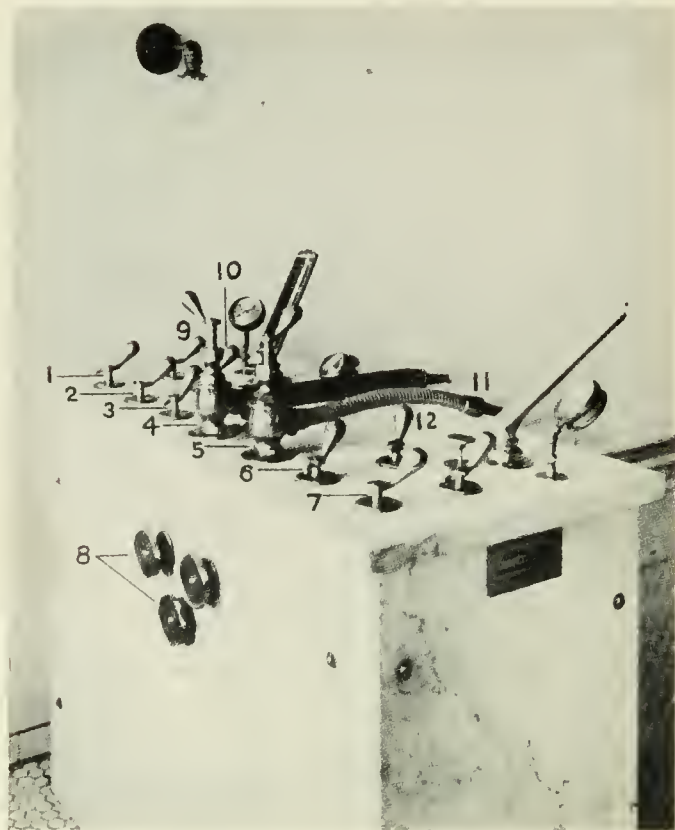


Fig. 24.—The author's douche table, showing recently devised Richter metallic hose. 1, 6, Hot water faucets; 2, 7, cold water faucets; 3, ice-water faucet; 4, rubber and metal hose; 5, all metal hose; 8, pressure regulators (water outlets); 9, rain bath; 10, circular douche; 12, steam faucet. Pressure is regulated by water flowing out at 8. (Hydrotherapeutic Apparatus Co.)

nation, although he has substituted the original semi-circular perforated pipes by the adjustable rose showers

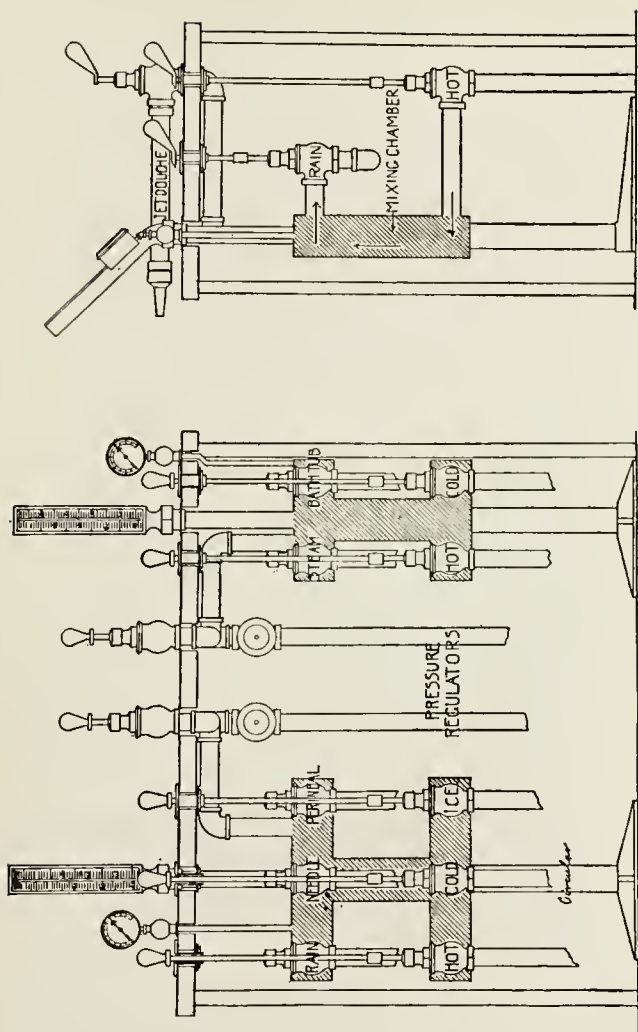


Fig. 25.—Interior of author's douche table. (Courtesy of Mr. Frank Richter.)

with movable perforated plates, which are readily cleaned, while the perforated pipes often became obstructed by sand which could not be removed without difficulty.

Specifications for Douche Table.—The author's douche table not being patented, Mr. Frank Richter, who has

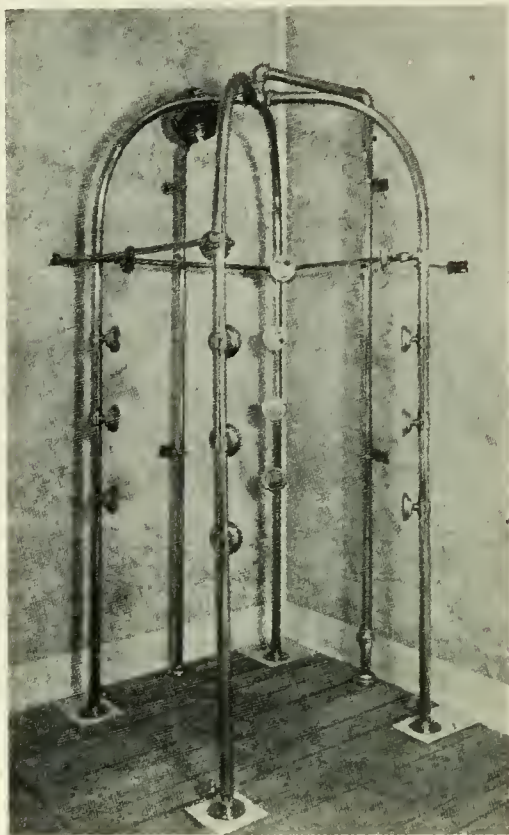


Fig. 26.—Circular douche showing slatted floor. (Hydrotherapeutic Apparatus Co.)

constructed many of these under the author's direction, has kindly furnished the diagram (Fig. 25) and following specifications:

Main Water-supply.—From the main supply of building or street make a $1\frac{1}{2}$ - or 2-inch independent cold water connection with a brass gate valve. The water-pressure to be not less than 20 pounds nor more than 40 pounds; if pressure is below 20 pounds, same can be increased by means of installing an electric pump, having a by-pass and regulator valve, which can be set at any pressure, preferably 32 pounds, or if the pressure is too great, it can be reduced by installing a water-pressure reducing and compensating valve, being particularly careful not to use any water reducing valve that reduces quantity or volume of water.

Hot-water Tank Supply to Douche Table.—From the new main take a $1\frac{1}{2}$ -inch connection and run same to hot water tank for cold water supply to tank, and from tank run a $1\frac{1}{2}$ -inch connection to and connect same to hot water valves of douche table. Avoid connection with house supply.

Ice-water Tank Supply to Douche Table.—From new main take a $1\frac{1}{2}$ -inch connection and run same to ice-water tank, and from ice-water tank run a $1\frac{1}{4}$ -inch connection to and connect same to ice-water valve of douche table.

Hot and ice-water tanks should be installed as close as possible to douche room.

Cold Water Supply to Douche Table.—From the new main take a $1\frac{1}{2}$ -inch connection and run same to and connect with the cold water valves of douche table.

Steam Supply to Douche Table.—Make a $1\frac{1}{4}$ -inch connection to the main high-pressure steam supply, and run same to this department, making a 1-inch connection, and running same to and connect to the steam valve at douche table. Take a 1-inch connection and run same to and connect to the steam coil of hot water tank, running the return of coil to an approved steam trap.

Douche Table.—From the douche table run a separate $1\frac{1}{4}$ -inch connection to the circular douche, a 1-inch connection to the rain douche.

Do not use any shut-off valves except the main cold water valve.

Under no circumstances use the hot water of the building, and a separate supply of cold water for the douche room, as they will not when mixed under pressure maintain a designated temperature should any one

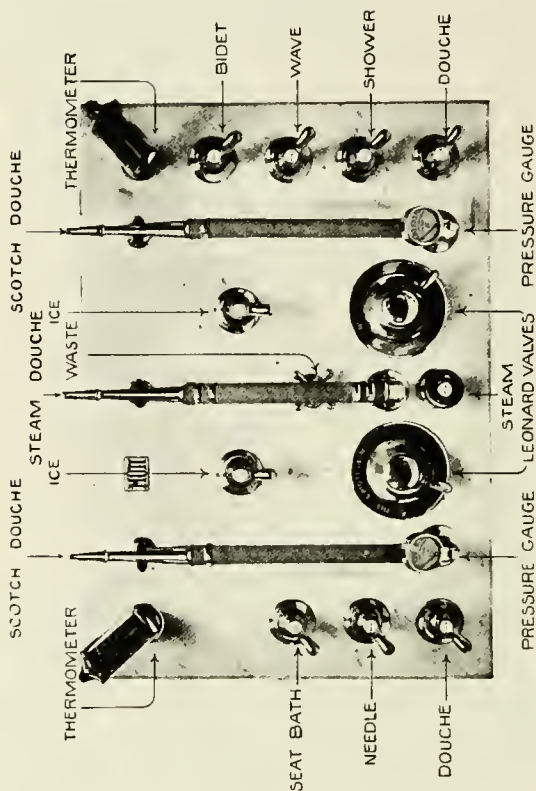


Fig. 27.—Plan of douche table devised by Mr. E. L. Penfrase.
(Courtesy of J. L. Mott Co.)

draw water hot and cold from plumbing fixtures in the building.

The hot water tank may be of black steel, galvanized, or copper, of not less than 250 gallons capacity, set horizontally and heated preferably with steam, through

a manifold brass or copper coil, containing about 70 feet of piping and furnished with a temperature regulator set at 160° to 170° F., or heated with a coal stove of not less than 400 gallon capacity and with a hot water damper regulator, or heated by gas, with a No. 400 size Ruud, Pittsburg, Hoffman, etc., multi-copper coil automatic storage system gas heater.

The ice-water tank is supplied by the refrigerating plant, or may be constructed of three galvanized

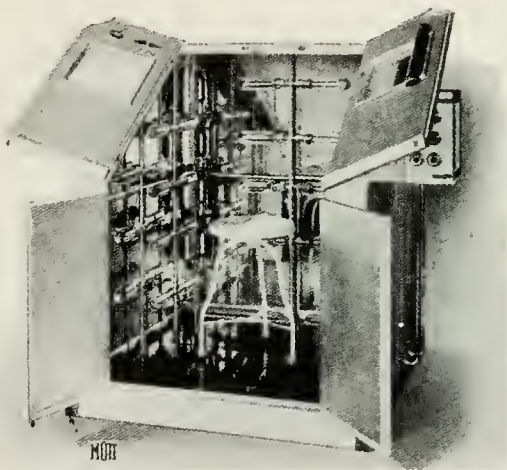


Fig. 28.—Electric light cabinet. (Courtesy of J. L. Mott Co.)

cylinders connected in series, and placed in a copper-lined insulated box, with enough space for two cakes of ice and allowing the waste to cover one-half of the cylinders.

The **hot air cabinets** (Figs. 28, 29) which, as will be shown, are used to prepare the patient for the furtherance of reaction should be placed within easy access to the douche table. They may be warmed by steam coils or electric bulbs. For tonic treatment, in which the skin

must be thoroughly heated, but perspiration must be avoided, the steam-heated cabinet is superior, because the electric light acts by radiation and renders perspiration rapid and abundant.

I have used the steam coil heated cabinet for twenty-five years. Perspiration may be easily produced, if demanded, by increasing the supply of steam or prolong-

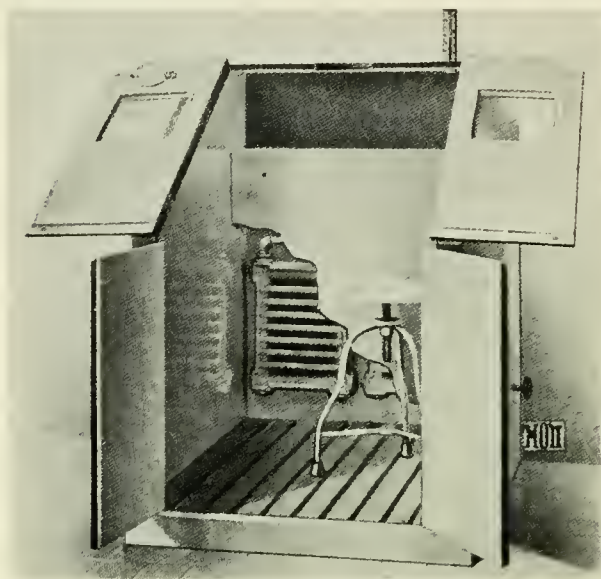


Fig. 29.—Hot air cabinet. (Courtesy of J. L. Mott Co.)

ing the procedure. Since, however, steam is not often available during the summer months, the following arrangement may be valuable:

The electric bulbs opposite the trunk may be made in two sets, one as usual, transparent, and the other half-transparent, and opaque opposite the patient's trunk. Provide a separate switch for each set. When eliminative

treatment is prescribed, turn on the transparent bulbs; for tonic treatment use opaque bulbs.

Thermometers for douche tables must be provided with magnifying lenses. These and the clock, with second hand, should be obtained from reliable manufacturers and be tested personally by the Medical Director.

Figure 23 represents the plan of a large institution. The table (Fig. 24) has been in use, treating 50 to 150 patients daily, for nineteen years without injury to any patient.

Figure 22 represents the plan of the Vanderbilt Clinic, using the same type of table and treating about 30 patients in two hours with similar result.

Any deviation from the plans or table construction is certain to lead to trouble, and to be costly by reason of loss of time due to frequent repairs. Moreover, the rapid disposal of patients will be precluded by changing the plan or pattern of table. Warrant for this statement rests on the fact that one of the tables of this pattern has averaged 25,000 douches per annum for ten years, and others of the same manufacture have furnished similarly large numbers in other institutions not under the author's personal direction.

We have discontinued the hip bath-tub and perineal douche in the equipment because we have not been able to confirm the therapeutic action claimed for them after long and careful trial. Most manufacturers still insist upon their constituting part of the equipment, but the author's observation is that they are unnecessary and inefficient and add needless outlay for instalment. Another addition often claimed as part of the equipment by manufacturers is a **shampoo table**. In the Riverside Association Hydriatric Department the shampoo table was advised for the first (and last) time by the author because the Turkish (cabinet) bath added to it much needed revenue. For a scientifically constructed douche room a shampoo table is a degrading addition; it belongs to the Turkish bath establishments. For this reason it is absent

in the Vanderbilt Clinic and other institutions designed by the author. In two large hospitals which were provided with a shampoo table, the douche room was used chiefly for giving Turkish baths to the officials of the hospital. In one of these (civilian) it was abandoned entirely, in the other (military) it has been removed after much opposition from the officer patients, who resented the deprivation of this luxury.

Faulty Hydrotherapy Instalment.—Lest architects and plumbers may regard my strictures upon their desire to use their own judgment in the construction of hydrotherapeutic instalments as unwarranted, the following instances from actual observations by the author may serve to exonerate him, especially since most of those errors were committed by men of the highest repute in their calling.

1. A very prominent plumber who had the contract for a hospital of 200 beds, assured me that he would build a cooling apparatus for the douche table without my assistance. This was completed during my absence. A double box, the interspace filled with charcoal, was lined on the inside with 1-inch galvanized iron pipes. The box was to be filled with ice, on the pattern of a beer cooler. The result was that the initial pressure of 40 pounds was reduced by friction to 10 pounds, entirely inadequate for the douche. On my suggestion three kitchen boilers of 60 gallons were connected and laid upon the bottom, the first connected with the water main *A*, the last with an inch pipe, leading to the douche table *B*. Blocks of ice laid upon these cylinders keep the water at the temperature required to reduce the city water to any temperature that may be prescribed.

2. In several hospitals supplied by Mr. Frank Richter, who is one of the few plumbers I have met understanding hydrostatics, the engineer was so insistent upon avoiding a separate water-supply for the douche room that Mr. Richter was overruled by the Building Committee, whose aim was to save expense. Some of these were compelled

to change their plumbing later at additional expense and loss of use of apparatus. In one of the largest hospitals for insane in the country the douche was practically abandoned because the temperature fluctuated dangerously, as I learned from personal inspection ten years later, by reason of the engineer's opposition to the more costly separate water-supply.

3. During the construction of one of the largest tuberculosis hospitals in this country I discovered accidentally that each floor of each of six pavilions had been provided with a douche room. Being requested by the commissioners to meet the architect, the latter gave as his reason that his intention being to build the most perfect institution in the country, he visited European sanatoria, in all of which he found more or less complete hydrotherapeutic equipments, which were absent in this country. In order to furnish the physicians every convenience and facility for this treatment he planned one douche room for every floor containing 25 patients to afford easy access to the worst cases. When the author informed him that the latter were unfit for the douche, and that this hospital was intended chiefly for second and third stage cases, he exclaimed, "Why didn't the great experts in tuberculosis who inspected and criticised everything else inform me of the fact? They all approved of the douche rooms." The latter were almost finished when I saw them, but the apparatus, though contracted for, had not yet been installed. Two douche rooms have sufficed during the past ten years for all the work in this time. Here an outlay of \$100,000 could have been saved.

4. The medical director of a city hospital in the West containing 100 beds requested the author to lay out a large basement the plan of which was finished for hydrotherapy. On inquiry regarding the number of outdoor patients, which are the chief, if not the only, patients for the douche, it was learned that the average daily number was 30 including all diseases. On the author's advice the hydrotherapy room was abandoned.

5. In two newly constructed pavilions of a large state hospital a fine hydrotherapeutic equipment is installed. The douche room is 20 feet square, with tile floor, containing a useless shampoo table at one corner and a douche table and circular douche occupying about 6 x 20 feet on the opposite side. Despite this ample space, the hot-air cabinets, three in number, are placed in an adjoining room 8 inches below the level of the douche room in such manner that patients walk from them nude and sometimes perspiring past a corridor 50 feet long, in which drafts must always prevail. And no cabinets for undressing are provided. These fine rooms were not in use one year later when I saw them and recommended a change of plan. They are not in use now, three years later.

6. A trustee of a great hospital for research requested me to plan a hydrotherapy instalment in order to make it "up to date." The author advised against it, because the number and character of cases would not warrant the outlay. The architect, however, called on me, and I laid out a small equipment, dwelling especially on the necessity that the continuous (hammock) baths, which he alone regarded appropriate for such an institution, be located near the wards in a separate room. What was his astonishment when he discovered two hot-air cabinets directly adjoining the door; these were separated by a marble wall from the continuous bath and the douche table on the opposite side of this small room. This arrangement necessitated the passage of all patients coming from the hot-air cabinets past the continuous bath-tub to the douche table. The patient in the tub, which is chiefly used for mania and delirium tremens, could be seen, and see every other patient and hear the noise of the douche flowing, etc.

7. The author was requested by the Surgeon-general to render personal aid to the commanding officer of the base hospital at Camp ——— in the arrangement of the douche apparatus, over which several expert plumbers and

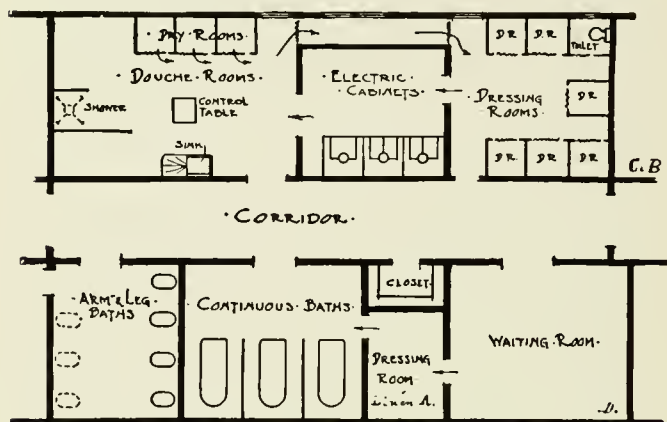
officers had been struggling. The architect had failed to provide a door sufficiently large to admit the electric cabinet, which was standing on the porch. The douche room (20 x 24 feet) was provided with sufficient windows to serve as a green-house; no dressing cabinet had been provided. The hammock bath rooms, in which maniacal cases were to be treated, were without doors and located opposite a toilet, and on a passageway through which all patients had to pass from the ward to the douche room. The author advised a space 6 x 20 feet on one side of the large douche room after several windows were closed. This arrangement furnished space for the electric cabinets and the drying cabinets. Dressing cabinets were provided in the adjoining room that had been designated for massage tables. Of course, a door was enlarged for passage of the electric light cabinet.

8. One of the most eminent firms of architects in this country sent its engineer to the author to examine plans for a hydrotherapeutic instalment which had been laid out by a hospital construction expert. Among other incongruities it was discovered that the room for undressing was located 70 feet from the douche room, and that patients would be compelled to walk the distance nude and pass through the rest-room. No one who understands the principles of hydrotherapy would provide a rest-room because the reaction obtained from the douche would be lost. All patients must go into the open after treatment to take advantage of deepened inspiration.

9. This plan (Fig. 30) represents a correction of a layout submitted to the author by the Surgeon-general for revision. In the latter the dressing cabinets were located at *D* in the lower right, and the continuous baths at *CB* in the upper right. This arrangement necessitated the patient's walking nude through the corridor to the electric cabinets and returning nude after treatment through the corridor to the dressing room. There was no drying room. The superiority of the revised plan is evidenced by the arrows. Moreover, three patients could be in the

electric cabinets, one under the douche, and three drying. There were two control tables and circular douches *adjoining*.

10. The author consented to demonstrate the douche in one of the neatest douche rooms that has come under his observation. He discovered a sudden rapid lowering of the water temperature in time to prevent harm to the patient. On inquiry, it was ascertained from the engineer that the hot water-supply, pumped with an initial pressure



PROPOSED LAYOUT NO. 1. HYDROTHERAPEUTIC DEPT.

Fig. 30.—Redrawn for author by Werner & Windolph, architects.

of 149 pounds, was reduced to a very low (unascertainable) pressure after passing through the wards, bath-rooms, etc., of the entire hospital before it reached the douche table. The cold water-supply of the latter had its source in the city main at 40 pounds pressure. The attendant remarked that whenever water is drawn in the kitchen the douche thermometer jumped up and down very strangely. And yet this douche room has been in use for ten years, having been installed by one of the great plumbing firms of this country. The saddest part, showing indifference to

correct hydrotherapy, is that the plans which the writer furnished by request for correction of these serious faults have not been adopted because of a few hundred dollars' expense. Some day a severe scalding accident will cost much more than this.

The great need of these brief comments is emphasized by the fact that the faulty constructions mentioned were the product of the highest type of architects.

Aside from the fact that only a perfectly constructed instalment may be dependable, another important consideration demands strict following of the plans, etc., here briefly outlined, viz.: When the apparatus ceases to functionate with precision or any parts break by reason of imperfect material or construction, its repairs, sometimes involving removal, involve loss of time, during which treatment must be abandoned.

As has been mentioned, discouragement follows failure that may be due not to the remedial agent employed, but to the manner of its employment, or the faulty construction of the apparatus. The same care is demanded in selecting the latter that is practised in the selection of correct surgical instruments and pure drugs.

THE DOUCHE

The douche differs entirely from the procedures hitherto described because the attendant does not touch the patient during the treatment. Friction due to the mechanical impact of the stream of water under a pressure of 20 or more pounds is relied upon to furnish the mechanical stimulation desired to enhance reaction. The apparatus for this purpose has been described. The attendant standing behind the douche table (Fig. 31) carefully adjusts the water temperature and pressure prescribed by permitting water to flow out of the outlet provided for that purpose. The patient is directed to stand just within the circular douche apparatus (so called because the original design provided several $\frac{3}{4}$ -inch circles of perforated tubes) and to grasp the anterior upright tubes with each

hand. The attendant directs the stream first upon the back, either in solid form (*jet douche*) or in the shape of a fan, which is produced by placing the tip of the index-finger upon the nozzle outlet (*fan douche*). The *douche* is moved *slowly* up and down the trunk and extremities.

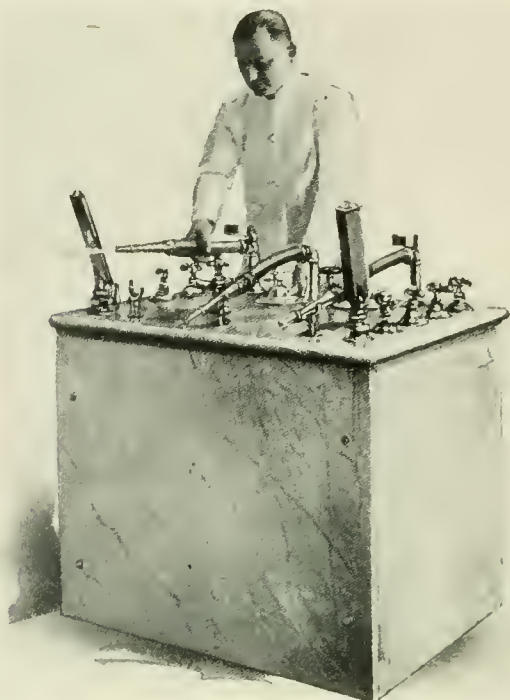


Fig. 31.—Position of attendant. (Courtesy of J. L. Mott Co.)

The patient is directed to turn to receive the fan *douche* on the anterior portion of the body. The *jet douche* is never applied to the latter. On expiration of the time prescribed, as ascertained from the clock, the patient is dried by the attendant after the first treatment and sent into the drying cabinet, or he may dry himself in the

latter. He now proceeds to the dressing cabinet, whence he goes out into the open. Reaction is furthered by not permitting him to remain in a warm room, and the deep inspiration produced by the douche facilitates oxygenation of the blood in pure air. In the beginning of the treatment he is directed to walk or otherwise exercise gently. A feeling of lassitude will warn the patient against excessive exertion. Repetition of the douche is made in accordance with the prescription. It may be ordered biweekly or triweekly at first in feeble patients, but it should be the aim to reach daily treatment.

Rationale of the Douche.—This procedure is used in afebrile cases, the object being to stimulate by thermic and mechanical excitation the cutaneous nerves, from which effects are conveyed to the central nervous system and reflected upon organs, the functioning of which is to be enhanced. Reaction is more rapid than in any other treatment by reason of the simultaneous friction of the steam driven with strong pressure upon the skin. There is no assistance given to the patient during the procedure, but if his reaction is feeble in the beginning it may be furthered by friction by the attendant after drying.

I have devised the term “neurovascular training” for the douche (although it is applicable also to other hydiatric procedures) upon the principle that the effect of thermic and mechanical excitation upon the cutaneous nerves is gradually increased by repetition, with lower temperatures and longer duration at each treatment, until the patient responds readily to a procedure which he could not accept in the beginning, just as is the case in the training of the arm muscles by dumb-bells of gradually increasing weight.

The therapeutic aim is to enable the patient to *react without assistance from the attendant and without the preceding hot-air bath* to low temperatures (70° to 80° F. or less) and two or more minutes’ duration. Experience has demonstrated that when this point is reached the instability of functional neuroses disappears in many cases.

Mode of Prescribing Douches.—The large number applying for treatment in the clinics necessitates the same routine method of prescribing which is in vogue for drugs in dispensaries. They were furnished with pads, on the pasteboard back of which was printed the following:

FOR WORKING PEOPLE

Please fill out kind of TREATMENT desired, whether
T., E., R., or C.

Tonic—to improve nutrition and hematosi8; useful in neurasthenia and other neuroses, dyspepsias, phthisis, bronehitis, asthma, intestinal troubles, anemia.

Eliminating, in diseases of faulty tissue change; *e. g.*, rheumatism, gout, neuralgias, diabetes, syphilis, etc.

Reducing, in obesity, etc.

Cleansing—to improve hygienic condition and personal habits of the poor.

These pads were furnished to out-door departments of several hospitals and many physicians.

On the prescription blank was printed:

RIVERSIDE ASSOCIATION

259 West 69th St., between Amsterdam and West End Aves.

HYDRIATRIC DEPARTMENT

Hours: 10 A. M. to 8.30 P. M. { *Men:* Tuesday, Thursday, and Saturday.
Women: Monday, Wednesday, and Friday.

Date

Name.....

Diagnosis.....

Treatment.....

.....M. D.

(See back of pad.)

Tonic treatment consists of the hot-air cabinet, in which the patient sits with a wet turban around his head. Here the patient's skin is thoroughly warmed, perspiration being avoided. When the attendant is too busy, the patient is instructed to avoid perspiration by lifting the lid of the cabinet and notifying him. Entering the douche room, the temperature and pressure having been arranged, the patient is subjected to the fan douche, which is produced by slightly pressing the index-finger-tip of the hand holding the nozzle upon the stream issuing from the latter. This produces a fan-like spreading of the stream. The latter is slowly passed over the entire body from head to foot, beginning with the back, proceeding to the front, and finishing with each side. Rapid fanning must be avoided to prevent chilling. From day to day the fan douche is made coarser by diminishing the pressure of the finger-tip over the nozzle point until it becomes a jet douche, by withdrawing the finger altogether. Patient is then dried and sent to the dressing room, whence he proceeds into the open air, irrespective of the weather. The latter must be insisted upon because the best advantage is thereby taken of the improved inspiration and circulation. The circular douche may be omitted in clinics.

This procedure is repeated daily, the *temperature being reduced* one or more degrees, unless reaction is feeble, indicated by chilliness after dressing. In this event the duration of the procedure is diminished, but the *water temperature is not increased*. When reaction improves the former duration is gradually restored.

Usually improvement is noted before 70° F. is reached. Now the duration of each procedure is increased ten seconds daily, until the longest duration (five or more minutes) is reached with good reaction, following the principle that while a brief application of the douche is stimulating, its prolongation produces more lasting *tonic action*. This is termed *neurovascular training*.

It may here be mentioned that on entering the clinic the patient's name, etc., are registered and his weight in

the nude state recorded before treatment and every week thereafter. Temperature, duration, pressure, and reaction are recorded each day on patients sent by dispensaries and outdoor departments of hospitals. Thousands of these records have been made in one institution. In the Vanderbilt Clinic the different departments, neurology, etc., refer their patients to the Hydrotherapy Department. Enhancement of nutrition is frequent.

Eliminative treatment (formerly called *alterative*) consists of retaining the patient in the hot-air cabinet for five or more minutes *after* perspiration is started. This is followed by a circular douche of two or more minutes at 100° F., reduced at the close to 90° F. or less. This is followed by a jet or fan douche (95° F.) for one or more minutes and daily reduced one degree. Drying and friction and dressing follow. These patients are also sent into the open air. No unpleasant results have been recorded among thousands of cases from this exposure to the weather even when inclement. Patients who have been in the habit of taking Turkish baths frequently object, until it is pointed out to them that not having breathed the hot air pervading these baths, the invigoration by the gradually cooled douche protects them against cold.

Reducing treatment consists of a hot-air cabinet in which the patient is retained ten or more minutes *after* perspiration begins, during which time 1 ounce of ice-water every three minutes is taken, which stimulates diaphoresis. Entering the douche room, the patient receives a circular douche at 100° F., gradually reduced to 90° F. He is dried with friction, and after remaining five to ten minutes in the anteroom he is advised to go home.

For Cleansing.—The patient is referred to the shower-baths in the basement, where soap is available.

For the use of the Army Reconstruction Hospitals the author was privileged to recommend to commanding officers and to the Surgeon-general the following formula, which is the result of conferences with groups of medical officers of various branches in several of these institutions:

U. S. ARMY HOSPITAL No. —

PHYSIOTHERAPY DEPARTMENT

Name.....Ward.....

Organization.....Rk.....

Diagnosis.....

Mark treatment desired and No.

1. *Electric.*2. *Orthopedic.*3. *Hydriatric.**Eliminative.**Sedative.**Tonic.**Stimulant.*

... ..19Surg.

Report of Director or Attendant

1.....

.....

2.....

.....

3. Reaction: Fair.....Good.....Bad?

Weight, pounds.Last weight.....

Remarks.....

.....

.....

.....

.....19Director or Attendant.

On the back of the pad the details of these procedures are printed as follows to avoid misunderstanding:

DETAILS OF HYDROTHERAPY

Tonic.—Indicated in cases requiring enhancement of physical condition. Consists of hot-air cabinet until warm (avoid perspiration), followed by fan douche, 90° F., ninety seconds, 25 pounds pressure. Temperature is reduced 1 degree and duration increased ten or more seconds each day after 70° F. Friction follows.

Patient goes into open air.

Record Temperature and Duration daily on prescription.

Eliminative.—Indicated in cases requiring enhancement of metabolism (rheumatism, gout, etc.). Consists of hot-air cabinet to perspire five or more minutes. Followed by circular douche, 100° F., gradually reduced to 90° F. or less for two minutes or longer. Jet or fan douche (95° F.), lowered daily. Friction follows.

Patient remains in house.

Sedative: (a) Wet pack, 70° F., one hour in bed before retiring. If not asleep, dry gently. (b) Continuous bath, 100° F. for . . . hours.

Stimulant.—Indicated in physical or mental depreciation. Add jet douche, same temperature, to tonic treatment before conclusion.

For local stimulation of wounded parts use whirlpool bath 110° to 115° F.

Special Treatment.—For sciatica the Scotch douche (70° alternating with 110° F.) is added over the Nerve to Tonic or Eliminative Treatment.

For arthritis, Scotch douche around, *not over*, the joint is added to Eliminative Treatment.

Avoid Scotch douches over trunk.

General massage or electricity should not be given within four hours of a douche.

In the Reconstruction Hospitals the arrangement of a physiotherapy director did not appear to work well. I never met an army surgeon who was familiar with all branches of physiotherapy, least of all with hydrotherapy. Schools for instruction of officers and attendants are sadly needed.

In private and clinic practice I found satisfaction in reports of reaction, weight, etc., by the attendants after each series of procedures ordered. Changes were made as necessary.

WHIRLPOOL BATHS

This novel form of douche was adapted by Dr. Fortescue Fox, of London, from the water current baths practised in the French Army Hospitals in the treatment of ankylosed and edematous limbs of wounded soldiers. It offers a combination of a continuous bath of high temperature with a strong water current produced by electric pump or hydrostatic pressure. The limb is usually confined in a vessel (Fig. 32) from the inside of which issues the water



Fig. 32.—European whirlpool baths. (Courtesy of J. L. Mott Co.)

in a whirling fashion. I am indebted to our British colleagues for the following data:

At the British Red Cross Hospital at Netley a series of whirlpools are operated by a pump and automatically kept at a constant temperature. This bath is very economical of heat and water, as when once the temperature is set the water can be circulated indefinitely with a gas burner to maintain the heat.

The limb baths are usually given at 100° to 105° F.

and as high as 120° F., and may be continued for fifteen to forty or even ninety minutes at a session.

Whirlpool baths are said to stimulate the arterial circulation in the most powerful manner. Their action in this respect is more striking than that of any other method. That they also stimulate the lymphatic circulation, and accelerate the retrogression of inflammatory processes, seems clear from the rapid diminution of edema and synovial and other effusions that sometimes attends their use. They have a marked sedative effect in relieving pain and muscular spasm, and often enable painful and sensitive limbs to be handled and moved with comparative ease. They are consequently used for trophic lesions resulting from prolonged suppuration, chronic edemas, swellings of the periarticular tissues, fractures of the articular ends of the bone, and painful and adherent cicatrices. Whirlpool baths at high temperature may be given with advantage as a preparation for massage and movement, which are by their use rendered easier and less painful. Similar baths at a lower temperature promote the cleansing and healing of wounds and the separation of dead tissue. These baths have been extensively used at the London Clinic just mentioned, especially as a preparation for, or in substitution of, massage, and to assist the mechanical treatment of injured limbs.

Those who have had to treat a large number of injuries after the wounds have healed and inflammatory reactions have subsided will notice that the temperature of the limb is usually subnormal, no doubt in consequence of long disuse and immobility. The part is often blue and cold to the touch. This will be readily appreciated by observing the color and temperature of the corresponding arm or leg. The whirlpool bath, repeated day by day, in many cases restores the normal warmth and color. This alone, no doubt, assists the processes of nutrition and repair, whether of bone or of the softer tissues.

But it seems probable, also, that raising the temperature of the limb 12 or 15 degrees above blood heat hinders

the activity of included pathogenic micro-organisms. It is remarkable that many of these microbes are limited, as respects their growth and activity, to a very narrow range of temperature. If they thrive best, as is usually the case, at about the temperature of the blood, it should be sometimes possible to deal effectively with localized pockets of microbes in the vicinity of scars and wounds simply by raising the temperature of the tissues. This may probably be part of the rationale of whirlpool and other local hyperthermal baths, as well as the "intention" of the pyrexial reaction in infective disease.

Dr. F. P. Nunneley, of Llandrindod Wells, reports 60 cases within four months.

"The period of immersion is usually of twenty minutes' duration; the temperature should be as high as can be comfortably borne—in most cases from 110° to 120° F. Before the limb is immersed the bath is filled with water at a temperature of about 100° F. and the temperature is gradually raised to the limit of endurance. It will frequently be found that the higher ranges of temperature—100° to 120° F.—cannot be borne at first, but, as a rule, after one or two treatments tolerance is acquired. It is necessary to proceed very cautiously when treating cases in which nerves have been injured and there are areas of anesthesia or partial anesthesia. The skin supplied by the injured nerves is frequently in a very atrophic condition, and scalding of these areas may take place without the patient having complained of any discomfort in the normal portions of the limb.

Very shortly after the limb has been immersed in the bath the skin becomes flushed, pain is relieved, and a feeling of comfort is experienced. The tissues become more supple and movements can be made which previously were painful or impossible. After the bath the limb is found to be in a condition of considerable hyperemia. The skin is red and feels hot, and it is probable that the internal temperature of the limb also is temporarily raised. There is usually a slight increase in bulk, varying in the

case of the thigh from $\frac{1}{2}$ to $\frac{1}{3}$ inch in circumference. The tissues are soft and relaxed, and will bear manipulations which before the bath would have been too painful, a point especially emphasized by Prof. Tait McKenzie. In a large majority of cases the whirlpool bath is used as a preparation for subsequent massage and manipulations. In this hospital radiant heat was formerly used for this purpose, but when the whirlpool baths had been installed they were substituted for the radiant heat in every possible case, so that the views of masseurs and patients who had had experience of both methods of treatment could be obtained. The opinions expressed were unanimously in favor of the baths. The masseurs said that the tissues and joints were more easily manipulated, and the patients stated that the manipulations were less painful. Subsequent experience has confirmed the correctness of these early observations. Adhesions are frequently and almost painlessly broken down, and function seems to be restored more rapidly. Some members of my staff have found that, when there is great tenderness, they can employ deeper massage and obtain more movement while the limb is still in the bath than if they wait till afterward. But the whirlpool is not only a thermal bath; in virtue of the lavage and elastic pressure produced by the rapidly moving water, it must be regarded as an efficient form of gentle massage. In cases where the use of hand massage is contraindicated by the danger of disturbing the barriers erected by nature against the spread of infection, the whirlpool bath is of considerable value. An increased flow of blood is induced by its thermal qualities, while resolution and removal of inflammatory products is facilitated by the massage of the rapidly moving water.

When nerves in the vicinity of a wound have been slightly injured but not destroyed, treatment is apt to be extremely difficult. The application of heat frequently increases the pain, while massage—which may be urgently needed for the preservation of the utility of the limb—is rendered impossible by the pain which it causes.

In these cases the whirlpool bath at a "neutral" temperature acts not only as a substitute for hand massage but also relieves the pain to a remarkable extent.

Referred Pains.—Pain in the missing hand or foot, so frequently felt after amputation, is rapidly allayed by the whirlpool bath. The effect of the bath seems to be increased if one of the jets is allowed to play directly on the tissues covering the nerve which is apparently at fault.

American Observations on the Whirlpool Bath.—In the absence of personal experience with this novel device the author submits the following data which he sought from and obtained through the courtesy of Surgeon-General Ireland, U. S. A. He has entered into them with considerable detail because he regards them as a valuable contribution to hydrotherapy in civil life, when the rationale of the device is understood.

U. S. Army General Hospital No. 2,

Dr. S. Barueh,

Fort McHenry, Md.

Dear Doctor:

In compliance with the letter received from Major Frank B. Granger, of the Surgeon-General's Office, I am sending you a statement of the whirlpool baths, as we have found them after over a year's use in this hospital.

With kind personal regards, I remain,

Very truly yours,

Wm. J. Tindall,

Major, Medical Corps.

(a) The nature of cases treated in this hospital by the whirlpool baths are: Old gunshot wounds resulting in joint injuries, stiff and swollen joints, painful stumps, scar tissue, bone injuries, old fractures, sprains, partial paralysis, and nerve injuries.

(b) The temperature of the water used for these baths is from 110° to 120° F., the pressure used is from 15 to 30 pounds, according to the apparatus installed.

(c) The duration of the bath is from ten to twenty minutes and frequency of application, daily.

(d) We have found that the whirlpool bath is one of the most valuable modalities used in the Hydrotherapy Department of this hospital in the treatment of war wounds. It is no doubt one of the most powerful curative physical methods at present at our disposal. Its soothing warmth changes the cold purple of the swollen and painful hand or foot, leg or arm into a warm red, softening the parts for massage and passive exercise and increasing its conductivity for electric treatment, pain is reduced, and the circulation and nutrition of the part increased. One very important feature is the great economy in massage; we have found that the duration of massage is reduced from thirty to ten minutes. The actual process is easier and less laborious, while the results are in every way superior to those which could be obtained previously. We can say, therefore, that the *results have been good* in all cases treated.

Wm. J. Tindall, Major, M. C.,
Director of Physiotherapy.

U. S. A. General Hospital No. 3,
Rahway, N. J.,

Dr. S. Baruch, September 12, 1919.
My dear Sir:

I am in receipt of a communication from Major Frank B. Granger of the Surgeon-General's Office, who requests me to give you some information regarding our use of the whirlpool baths.

Both the arm and leg baths here, four in number, are in almost constant use. We have given from four to five hundred of these baths weekly since the first of the present year. We find them remarkably efficacious; we use them on arm and leg stumps, to soften scar tissue, in cases of ankyloses following gunshot wounds near joints, in cases of peripheral nerve paralysis, preliminary to massage and electrotherapeutic treatment, in cases of sprains, recent and chronic, and in other cases where we desire to

produce a local and general hyperemia. The temperature of the water varies from 100° to 120° F. I have seen no cases which have not been benefited by their use, except in cases of open wounds, when we use the electric baking treatment.

Yours very truly,

James C. Elsom, Capt., M. C., U. S. A.,
Director, Physiotherapy.

Captain F. A. Bardwell, M. C., U. S. A., has also reported his observations at the hospitals at Fort Snelling and at the Walter Reed General Hospital, Takoma Park, D. C., which entirely agree with the above statements. Capt. Bardwell has invented a form of whirlpool bath for which he and others claim superiority over those used in Europe, in that his apparatus possesses, as he writes, the added advantage of little expense to install and none to maintain. Advantage of the water pressure is taken for mixing air with the inflowing water. Other advantages of this apparatus over those previously in use are great economy of hot water, and that it may be installed at any point where an ordinary sink may be placed (Figs. 33, 34). An ejector is attached by which the flow of whirling water may be directed at predetermined temperature from the thermostatic valve upon the part of the arm or leg that is subjected to treatment.

The prescribed temperature is arranged by shifting to right or left the lever at point marked *T* (Fig. 33) and is registered by the thermometer at the point marked *R*, or if preferred, by the hand thermometer placed inside the receptacle containing the limb.

The control of flow, or pressure, is regulated by the handle at point marked *P*, while an aërating effect in the water is produced through the ingenious device in separate illustration *X*, which is constructed movable to suit the varying depths of the arm or leg bath.

The attendant directs the combination nozzle and aëerator toward a certain part of the arm or leg. The ejector re-

ferred to is clamped to the side of the receptacle and held in place by the screw at the point marked 1, which permits the turning of or the elevation of it within the receptacle. The air intake, which causes increased pressure and a minimum amount of water used, is arranged at a convenient height at all times above the water level.

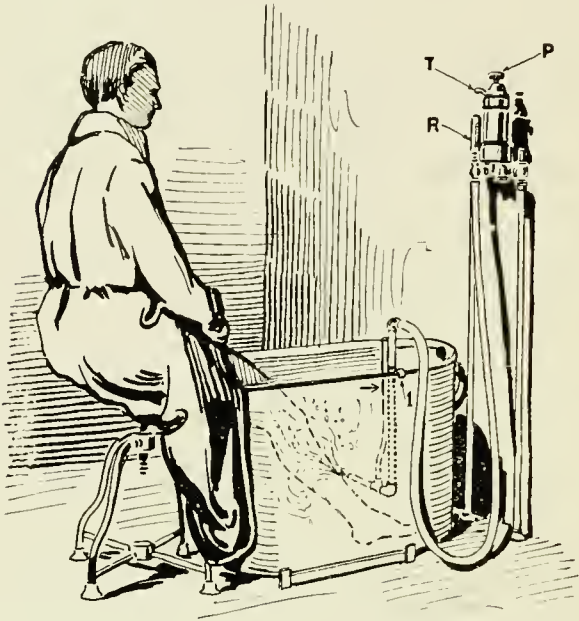


Fig. 33.—U. S. Army whirlpool leg bath. (Courtesy of J. L. Mott Co.)

The author would emphasize that owing to illness he has been unable to observe the practical working of this new American device.

The author has entered somewhat fully into the description of this new device because it offers opportunities in civil practice which are not otherwise at our disposal.

It appears to be the consensus of those experienced in this treatment that a high temperature combined with the whirling movement under strong pressure are the potent elements in stimulating without the secondary relaxing effect, and thus removing products of inflammation and destroying bacteria.

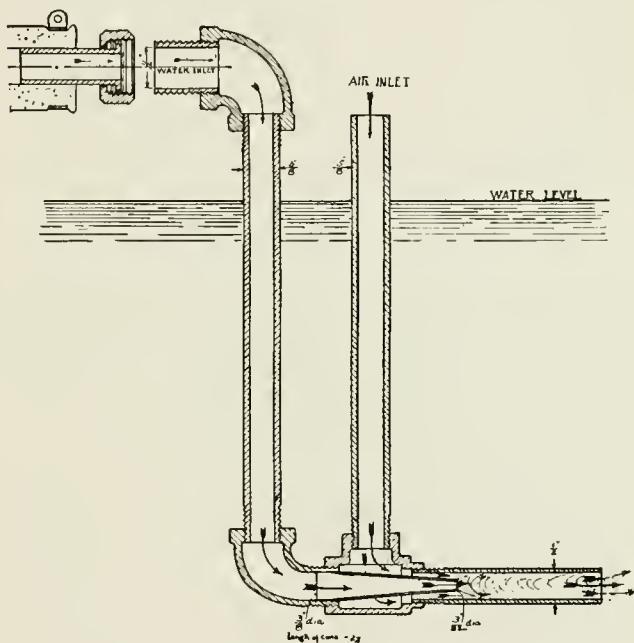


Fig. 34.—Captain F. A. Bardwell's aërotor.

If this observation is confirmed in civil practice a large field for this apparatus is offered by chronic synovitis, especially when pathogenic organisms are present which are destroyed by high temperature; for example, gonococcus, tuberculosis, or staphylococcus.

Cases of neuritis of whatever origin appear to be adapted for this simple treatment because we have a

combination of the continuous high temperature with the stimulating action of the current upon the absorption of local effusions.

A *word of caution* suggests itself to the author by the fact that he has seen, in the early part of its use, two whirlpool baths in which the current was under very feeble pressure and the temperature of one of which was 92° F. It is obvious that the effects claimed by the above authorities are impossible unless their exact technic in regard to temperature and pressure is followed. The device will certainly go into disuse unless this is done. A temperature of 92° F. and a feeble current must certainly aggravate the condition, the removal of which it is recommended for.

LAVAGE

This procedure has become established as a valuable substitute for emetics, so that the latter are rarely necessary at the present time. The technic of lavage requires special attention because its imperfect execution often discourages or disgusts the patient, who thereby loses all the valuable results to be obtained from it.

The patient is seated upon a chair, with a basin on another chair in front of him. A large towel, sheet, or rubber apron is secured around the neck, covering the entire front of the body. A firm stomach-tube with funnel and a pitcher containing 2 or more quarts of tepid water are made ready. Artificial teeth, if present, are removed. It is a common error to direct the patient to draw his head backward. The patient should sit upright with his head *slightly* bent forward. His apprehension that the tube will choke him must be relieved by telling him that the pharynx, as he knows, is capable of containing masses of food much larger in diameter. The physician or nurse, standing on his right, dips the lower end of the tube in warm water. Holding its lower 3 inches like a pen between the thumb and forefinger, the tube is introduced over the tongue without touching the latter, until it strikes the back of the esophagus. The patient being

told to swallow, the tube is slipped into the pharynx. In the first effort gagging may ensue, but an abundant mucus is soon secreted in the throat which lubricates the tube. The patient should be reassured that keeping his mouth wide open will relieve any sense of choking that may occur; also that if vomiting ensues *he must not attempt to remove the tube.*

A calm demeanor on the part of the physician will serve to allay his distress and urgent desire to have the tube removed. Several attempts may be required. If not successful after the third, the patient should be asked to return on another day. Some patients who at first declare it impossible to swallow the tube become so expert that they can introduce it themselves. Each daily introduction presents less trouble and distress. The tube being introduced to the mark usually found upon it, the patient or, better, an assistant is asked to hold it lightly but securely near the teeth, which should not press upon it. Having ascertained that the tube has not entered the trachea (an accident which I have observed once), water is now poured into the funnel. If vomiting ensues, the patient is quickly asked to lean over the basin and allow the vomit to flow out around the tube, while the latter is firmly held. If undigested food or tenacious mucus obstructs the lower opening of the tube the funnel should be held up to increase the water pressure. Sometimes it may be necessary to remove the tube, clean it, and reintroduce it. If lavage is made before a meal, as is my custom, such stoppage is not probable.

After a pint of water has entered the stomach the funnel *still containing water* is turned down into the basin, but not entirely emptied. Siphonage is impossible unless there is water in the funnel. Siphoning is repeated and fresh water added until no more mucus or débris appears.

Now the tube is firmly compressed by the thumb and forefinger in front of the patient's teeth and rapidly withdrawn.

A difficult patient may be reassured by seeing another

treated who is accustomed to the procedure. This is rarely necessary, however. Patience, calmness, reassurance, gentleness, and skill in manipulation will succeed in nearly every case. The reader will do well to follow these instructions closely in order to overcome the patient's apprehension.

Therapeutic Indications.—*Dyspepsia*.—There is no disease that perplexes the physician more than the various types of "dyspepsia." To diagnosticate the ordinary atony (gastric catarrh) from a neurosis of the stomach is not devoid of difficulty. It is my custom to bid the patient eat at 12.30 P. M. a full meal including such food as he claims not to be able to digest, and present himself at 5.30 P. M. for exploratory lavage. The stomach should be thoroughly washed out, even if several quarts of water are required. No larger quantity than 1 pint should be introduced at once unless siphonage fails. The washing should be carefully inspected to discover if the patient has masticated the food thoroughly. A clue will thus be afforded to the actual digestive powers of the patient and the latter may learn the necessity of better mastication. If the washing contains mucus it is important to distinguish between stomach and throat mucus. The former is a thick, tenacious, brown mass which floats upon the surface of the water; the throat mucus is clinging, transparent and stringy, and may be quite abundant, being the result of irritation of the pharynx. The quantity and quality of the stomach mucus indicates with some accuracy the condition of the gastric mucous membrane. Its rapid or slow disappearance under renewed lavage indicates the character of the disease.

In *atony of the stomach* the lavage should be made once a day before the largest meal to insure a clean mucous membrane and absence of fermenting material. The result is improvement of appetite by the stimulation of gastric movements. Motility is rapidly improved, atony disappears, the stomach empties more rapidly, fermentation ceases, and distressing symptoms gradually disappear.

The patient should be warned to gradually discontinue the lavage by intermissions and not to become accustomed to it. In most of these cases a tonic hydrotherapy is indicated, indeed, very necessary.

In *malignant disease of the stomach* daily gastric lavage often prolongs life and affords great comfort. Before the present chemical examination of test-meals came into vogue lavage enabled me to make a diagnosis of pyloric cancer from the long retention and decomposition of food.

Nervous Dyspepsia.—The author has been able to diagnose this condition from the result of lavage. In these cases the motility is usually increased and no food is found in the stomach; mucus is found in small quantities after long continuance of the disease. Unless severe gastralgia demands it, lavage should be refrained from in these cases, even if the patient urges it, as is often the case. A tonic hydrotherapy, together with an abdominal compress of 60° F., renewed three times a day and snugly applied to prevent discomfort, is of great value.

In *nausea and vomiting* following surgical operations lavage repeated at intervals, adapted to each case, has proved valuable.

In *intestinal obstruction* lavage, combined with intestinal irrigation, has been found of great value. Curschman reported 35 cases cured out of 105. It must not be continued too long, if it gives relief, lest surgery may be too late, a painful discovery made once in the author's observations.

In *gall-stone colic* great pain has been sometimes relieved by lavage, which should never be neglected.

INTESTINAL IRRIGATION

This procedure for mechanical cleansing of the large intestine has been long known as enteroclysis, high enema, etc.

There appears still to be a misunderstanding in some quarters regarding the difference between an enema

(which is so familiar that its technic is here omitted) and an intestinal irrigation. The former is for emptying the lower intestine and should be more or less irritating by addition of soapsuds, etc. The latter, on the contrary, should be unirritating, but intended to cleanse the mucous membrane of the tract. If the latter is not empty an enema should always precede the irrigation, otherwise the *latter will be made with a fecal solution*, which must defeat the main object. This obvious fact has rarely been mentioned by nurses whom the author had requested to describe the technic of an intestinal irrigation.

The idea that a rectal tube or catheter is necessary for an irrigation still appears to prevail in some quarters. The fact is, that an ordinary hard-rubber enema tube attached to a large fountain syringe suffices.

It has been indisputably proved by Roentgen rays that the rubber catheter almost invariably doubles in the intestine, also that colored water introduced with the ordinary enema tube is easily driven through an artificial anus in the right iliac region half a minute after entering the rectum under gentle pressure. The author has not used a rectal tube or rubber catheter in fifteen years.

Technic.—Into a clean fountain syringe one or more quarts of tepid water that has been boiled and to which a teaspoonful of salt has been added for the purpose of rendering it less irritating to the mucous membrane, is secured two or more feet above the bed or sofa, on which the patient lies, with towels to protect the latter. If an infant is the patient it is placed upon the lap on its abdomen on towels covering an oilcloth or rubber sheet, the lower end of which is placed within a small tub, to act as a gutter for the returning outflow. The floor should also be protected against the usual projected gush of the latter. If diarrhea does not exist, the lower intestine is evacuated by an enema of 1 quart of soapsuds, as an empty bowel is a *sine qua non* of an effective intestinal irrigation. The latter should be applied only after the normal or artificial removal of all fecal matter, because the latter ob-

structs the passage of the water and its solution will soil the irrigating water, destroying its cleansing properties.

The pipe, anointed with vaselin, firmly held, is introduced into the anus, water having previously been allowed to flow through it until it runs warm. There will be little distention, because the water will usually be expelled shortly after it is introduced. If it does not return it may be allowed to run out through the pipe, which must be detached for the purpose. The procedure is almost painless. Very young infants will cry, but older children may be quieted by being amused with playthings. In the adult the bed is protected and the solution retained as long as possible. If the water does not return clear, the irrigation must be repeated at once.

Rationale of Intestinal Irrigation.—Fluids introduced into the rectum, with careful occlusion of the anus, and aided by the position of the patient and sufficient pressure, not only fill the large intestine, but under certain conditions may also, as some authors have shown, pass through the ileocecal valve and irrigate the ileum. (The ileocecal valve is easily penetrated under moderate pressure; water flowing from a height of from 70 to 80 cm. can be made to pass into the stomach and even through the mouth, which is, of course, to be avoided as unnecessary and detrimental.) The capacity of the digestive canal varies greatly, the large intestine of an adult holding about 3 liters.

The author has no experience with hot irrigations by the double irrigator which is credited with favorable action in nephritis.

The action of the water flowing through the intestinal canal is chiefly mechanical, *i. e.*, it removes materials of decomposition and pathogenic elements, which are known to cause and maintain many cases of diarrhea and dysentery. If the fluid enters only (as is in most instances the case) the large intestine, peristalsis in the smaller intestine is evoked and the flow of bile is increased. The blood-pressure is somewhat raised, the kidneys are stimulated, the hepatic function is increased, and leukocytosis

is induced. There seems to be, indeed, a general acceleration of the metabolism, a general cell activity, when water above 110° F. is used.

The good effects of intestinal irrigation in icterus, cholelithiasis, and intestinal disturbances are due to the removal of decomposing and irritating matters, accumulated mucus, hence to a cleansing and disinfecting action, and not to a cholagogue action.

Diuretic Effect.—Flushing of the colon with warm water, followed by an injection of from $\frac{1}{2}$ to 1 pint of hot water, that is retained, is a quick, safe, and powerful means to stimulate the kidneys into action. To retain the hot water the patient should remain recumbent for a half-hour after receiving the injection. From 12 to 20 ounces of water at 110° F. can be retained at one time in the colon. Flushing of the colon with a large quantity of hot water (2 quarts at least at one injection) powerfully stimulates the action of the kidneys. Part of this effect is due to the internal application of heat and part to some of the water being absorbed.

The heart may be stimulated by the temperature of the irrigation as it is in water-drinking; the urinary secretion is increased by reason of the enhanced blood-pressure, which ensues at once in the kidneys, but also by direct absorption of fluid, which occurs later.

Therapeutic Indications.—*Infantile Diarrhea.*—The summer diarrhea of infants offers an excellent field for intestinal irrigation. If the technic be mastered and properly executed once or twice a day, no other remedy equals intestinal irrigation in removing pathologic products, soothing the suffering child, and promoting a rapid convalescence.

Catarrhal Jaundice.—The author has found an excellent adjunct in the treatment of catarrhal jaundice in irrigation of the large intestine with cold water. Once in twenty-four hours after the bowels have been evacuated, either normally or by enema, I order the patient placed in a knee-elbow position: from 1 to 2 pints of water at

70° F. are poured into the rectum from a fountain syringe. The patient is induced to retain the fluid as long as possible. On the following day the temperature of the water is decreased 2 degrees, and this decrease is continued until 60° F. is reached. From two to six irrigations are sufficient to produce the desired result. In my own experience the gastric and hepatic pains ceased after the first injection, appetite soon returned, and jaundice disappeared more or less rapidly, but that most distressing symptom—pruritus—was not relieved.

Asiatic Cholera.—In this disease, which has baffled the most skilfully devised medication, intestinal irrigation has proved of great service.

Uremia and Renal Insufficiency.—In acute conditions, with rapid and feeble pulse, irrigation at 110° to 120° F. has been given for forty minutes and repeated every four hours with good results. In one case the urine, previously scanty, was increased to 40 ounces and a pleuritic effusion was absorbed. In suppression with uremia, accompanied by high tension and pyrexia, rapid increase of renal secretion, bowel action and sweating, with decrease of tension are reported by doctors Grandin, W. H. Thomson, R. Coleman Kemp and Voorhees with the double irrigator of Kemp.

Dysentery.—In cases resisting ordinary treatment irrigation with 1 or 2 quarts of boiled water about 95° to 100° F., containing $\frac{1}{2}$ teaspoonful of salt to each quart, has proved a valuable auxiliary by removing pathologic products, subduing hyperemia, relieving the tenesmus more efficiently than anodyne enemata, and thus enabling the inflamed bowel to obtain that rest which in all inflammatory affections is the chief element of restoration. All these effects are due to the mechanical cleansing action of water. They demand careful attention to the details of the procedure, to inculcate which experience has taught me to be necessary. The first irrigation must be given in the presence of the physician.

In the author's somewhat extensive observations medi-

cation after the first purgative is futile, if not positively harmful, with the exception of large doses (40 to 60 gr.) of bismuth subnitrate every three or four hours to protect inflamed or ulcerated mucous surfaces.

In *amebic dysentery* the destruction of the amebæ and the prevention of their development from spores, which are buried in the tissue, cannot be accomplished by superficial washing or flushing of the intestinal canal, although this is important for cleansing.

The application of cold to the intestinal mucous membrane through prolonged douches seems to be the best method. The best results are obtained by irrigation with water below 45° F. from a glass reservoir containing cracked ice to maintain the temperature. The patient's tolerance as to quantity and temperature is the guide.

Out of 73 cases (reported by Tuttle) 70 were cured, 1 died, 1 had liver abscess before recovering, and 1 went to Europe improved.

The author is in the habit of ordering biweekly intestinal irrigations in most chronic cases coming under his treatment, on the theory that in many of these ailments constipation has produced abrasions by scybala and thus opened an avenue for auto-intoxication.

PROCEDURES ADAPTED TO VARIOUS DISEASES

THAT the progress of many acute, subacute, and chronic maladies is favorably influenced by the correct and systematic application of water has long been familiar to many physicians in ancient and more frequently in modern times.

The author's observations of half a century at the bedside, especially in consultation and by comparing results before and after his adoption of hydrotherapy, have convinced him that in certain conditions the application decides the issue of the case not alone between health and continued invalidism, which too often sends the sick to the empiric, but in many infectious diseases between life and death.

Such observations have prompted the author to add some chapters dealing with diseases in which hydrotherapy has served these purposes indubitably, with a view to point out in detail the proper technic and the modifications which may be followed with the greatest advantage.

TYPHOID FEVER

As in all fevers, ablutions are given every two hours. For technic see page 39. Also abdominal compresses at 60° F. are applied every hour during the waking hours (see page 75).

When the general condition of the patient causes suspicion, as when the *rectal* temperature persists at or above 103° F. without organic manifestations, the patient is placed upon a rocking chair, which has been covered with a blanket, over the latter a linen sheet. The bath-tub having been filled two-thirds with water at 90° F. the patient is drawn backward into the bathroom, placed in the tub, and rubbed for twelve minutes. Then he is wrapped in the sheet and blanket

and drawn back to the bed, dried, and made comfortable. Every four hours, if patient is awake and rectal temperature is 103° F. or over, the procedure is repeated, but the water temperature is reduced each time a few degrees (3 to 5) until it reaches 70° F. *If the rectal temperature is reduced by one of these baths 2 degrees or more, it is safe to pronounce the case not one of typhoid fever.* The less the temperature is reduced, the more certain is a diagnosis of typhoid fever. This is the Diagnostic Bath with which I have often settled a disputed diagnosis in the first week of typhoid. It is the result of long observation in hospital practice.¹

When the diagnosis is established as typhoid fever, it is my practice to bathe the patient at the bedside in a portable tub on two low chairs every four hours, when the rectal temperature is above 102.5° F., the abdominal compress being continued after reaction. This is the bath devised by Ernest Brand in treating the prisoners of the Franco-Prussian War (see page 153). The mortality was so greatly reduced that his assistant, Dr. Glénard, a prisoner, taught and practised it in France after the war. In fact, the only complete works on this subject are those of Tripier and Bouveret, of the Lyons Red Cross Hospital, and of Dr. Christian Sihler, of Cleveland, Ohio.

Clinical Evidence.—No therapeutic measure in the history of medicine presents so clear and irrefutable proof of its value as the cold friction bath.

A Bavarian surgeon, Dr. A. Vogl, in charge of the Munich Military Hospital, whom I visited to obtain exact data, has collected the statistics of that hospital during a period of forty-seven years, with regard to delirium, diarrhea, constipation, etc., giving the peculiarities of each epidemic, autopsy findings, details of treatment, which varied from bloodletting to coal-tar antipyretics and baths. The number of cases was 8325. They were treated by many different surgeons and the subjects were of the same sex and ages, living under the same condi-

¹ Principles and Practice of Hydrotherapy, 3d ed., p. 321.

tions with regard to food, exercise, and rest. Differing in this regard from observations made in civil hospitals they are as nearly perfect as possible. The mortality reached as high as 24 per cent.; was lowered by expectant treatment to 15 per cent. and by strict Brand baths to 2.7 per cent.

Statistical Proof.—The following statistics have been carefully sifted from the most reliable sources at the author's command. They are cited to convince those who fail to use this successful method of neglect of the best life-saving measure.

Mode of treatment	Cases.	Mortality, per cent.
Expectant.....	125,350	20.76
Brand baths by various reporters.....	7,426	4.26
Brand baths begun before fifth day	2,150	0
Brand baths, Munich Military Hospital, 1st Division.....	428	2.7
Lyons Red Cross Hospital.....	100	3
Mintra, Australia.....	173	5.4

American

J. C. Wilson, German Hospital, Philadelphia	94	1
J. C. Wilson (Cuban War).....	408	7.8
F. B. Stahl, Philadelphia Hospital (Cuban War)	144	2.8
Tuttle, New York Hospital.....	76	5
W. H. Thomson (Roosevelt Hospital).....	368	6.8
W. Gilman Thompson (New York and Presby- terian Hospital) (Previous mortality 16 per cent.).....	900	7.75
U. S. P. H. Service Report, 1917.....	55,417	19.47

A glance at these statistics confirms at least the statement of Prof. H. P. Loomis of New York (Medical Record, January, 10, 1903), and Prof. W. Gilman Thompson in his work on practice that the Brand baths have reduced the mortality from typhoid fever in the New York hospitals 50 per cent.

The question arises, Why is not this procedure now practised by the teachers who are here cited? The answer is furnished by the history of medicine. The only remedial agent that has held the medical profession for many centuries is bloodletting, the most irrational, destructive

ever conceived. When physiology and chemistry began to enlighten physicians this octopus ceased to exist. During the past few decades pharmacy has advanced greatly not in the development of curative agents, but in palliatives for relieving pain and reducing temperature, etc., the too active use of which interferes with the conservative processes of nature. Today we are overwhelmed by a new polypharmacy of drugs sold in ready-made packages that contributes more to the comfort of the doctor than to the safety of the patient. That water which has survived all vicissitudes still is forced to struggle for existence is due to the neglect of physicians, if we may judge from its non-use despite reliable facts like the above stated. *The day will surely come when physicians will return to the saner practice.* I warn them now to study the latest U. S. Health Report for April 13, 1917, which shows clearly a mortality of 19.47 per cent. in 55,417 cases. If the mortality in 900 cases observed by Dr. Gilman Thompson in the Presbyterian and New York hospitals was reduced from 16 to 6 per cent. by the Brand bath, is it not our solemn duty to save many of these 5000 lives?

In view of this fact we are assuming a serious responsibility in neglecting this life-saving measure because of inconvenience or objections on the part of the patient. It is at least incumbent upon those who reflect to overcome the latter by utilizing some substitute. The author has found extremely satisfactory the addition of CO₂ from the Cassebeer, Triton, or Zeo preparation to the cold friction bath. The sense of cold is diminished greatly by the tingling from the CO₂ bubbles, which meets the well-grounded opposition of patient and friends, to the chilling effects of the plain water. In impending heart failure the addition of 12 pounds of salt to 60 gallons of bath CO₂ water furthers absorption of CO₂, with all the physiologic aid to the respiration and circulation fully described on page 99.

Dr. A. V. Meigs, of Philadelphia, has reported good results from rubbing the body every two hours with flat

pieces of ice held within gauze and dipped in cold water. This procedure is physiologically an efficient vasomotor stimulant, and less heroic than the tubbing. The mortality in 214 cases was 6.72 per cent., while the mortality from cold plunges was 11.50 per cent. The latter evidently were not Brand baths.

Dr. Cabot reports from the Massachusetts General Hospital 800 cases of typhoid fever treated with ablutions from a sponge holding water at 65° F., accompanied by friction, the patient lying on a rubber sheet. The method of so competent a clinician merits trial. It should be repeated every three hours if the patient is awake.

The *Riess bath* (page 90) is another substitute which promises good results.

SUNSTROKE¹

New York enjoys an unenviable reputation with regard to the prevalence of this disease, and especially its fatality. Between 1895 and 1911 the lowest mortality was 24 in 1902, and the highest 1229, in 1901.

Sunstroke is the only disease in which water is recognized by all authorities as the chief, indeed, the sole remedy.

The hydrotherapy of the average text-book is *faulty* by *omission* in other diseases, but is *fatal* by *commission* in sunstroke.

The usual reasoning is as follows: Sunstroke is produced by excessive heat; its chief manifestation is high temperature, hence the proper treatment is to reduce the body temperature to normal; cold water is the most efficient antithermic agent in sunstroke, ergo, the coldest bath promises the most favorable results. This proposition involves several errors, the exposition of which may serve the purpose of a better understanding of the theory and practice of hydrotherapy:

- (1) While excessive temperature is the chief manifes-

¹ Adapted from a lecture delivered at the College of Physicians and Surgeons, Columbia University, New York, published in *International Clinics*, Vol. II, Series 22.

tation, it is not the essence of the disease, and though its reduction is imperative because hyperpyrexia imperils life, clinical observation demonstrates that many dangerous cases are not accompanied by extremely high temperature, precisely as we were taught by bedside observation in typhoid fever. Moreover, if reduction of temperature were the only, or even the chief, therapeutic indication, the coal-tar preparations would offer the key to the situation.

(2) Those who are familiar with the action of baths know that the most antithermic effect is not produced by the coldest bath, but by the hammock (continuous) bath at a neutral temperature, prolonged for an hour or more. I am not acquainted with any text-book on therapeutics or practice which mentions this important fact on hydrotherapy, and even the best works—books which on all other subjects offer perfectly safe counsel—reiterate in each new edition the fallacious ideas on theory and practice in the treatment of sunstroke which have resulted in needless fatalities, as shall appear presently.

I propose to clearly demonstrate that a mortality of 38 per cent. in sunstroke is absolutely indefensible, and to explain the reason for the fatality of a treatment which is reiterated in one form or another in every text-book. It is a trite physiologic fact that when the animal body is exposed to a temperature higher than its own the sensory nerve-endings which form the temperature sense convey the irritation to the vasodilator center in the medulla, and an increase of the large vascular area in the skin is produced in response to this excitation; according to the Dastre-Morat law of antagonism, dilatation of the cutaneous vascular area is accompanied by a corresponding narrowing of the splanchnic vessels; the blood which is becoming heated at the point of exposure (the skin) reaches the important visceral circulation but slowly, thus safeguarding important organs. At the same time heat is radiated from the skin and the latter is cooled by perspiration and its vaporization; the lungs assist by exhaling moisture.

Breitenstein subjected rabbits in a box to a temperature ranging from 95° to 113° F. He found that the red cells are diminished in the blood taken under all precautions from the lobe of the ear after removal from the box, and that the blood of the liver showed an increase of these corpuscles. It has also been demonstrated by Opitz in Columbia University laboratory that the blood of dogs which were exposed to baths at 109.4° F. (42° C.) had its viscosity decidedly diminished. This change has also been noted by other experimenters.

Most cases of sunstroke arise in persons who are exposed to temperatures higher than those used in the experiments on the animals mentioned. During the epidemic of 1896, which in New York City produced 648 deaths in one week, the average temperature in the sun was 119.3° F.

What are the clinical manifestations caused by the influence of high temperature? Observations in the heating cabinets of the clinic demonstrate daily that by exposure to high temperatures the respiration is accelerated, the pulse is increased 2 to 30 beats, the mouth temperature rises 1 to 3 degrees, and not rarely the patient feels faint despite the precautionary cold wet compress around his head. Judging from this group of manifestations arising from brief exposure, if the temperature were maintained for a long period, say, of hours, it would produce positive cerebral anemia, a reduction of blood-pressure, hyperpyrexia—in short, all the manifestations which are familiar in sunstroke. As a result of this depreciating influence of heat on the vasomotor system the eliminating functions of the organism are handicapped, and the most energetic efforts must be put forth by the conservative agencies of the body to maintain the equilibrium by excretion. No wonder that they fail, and many persons succumb to the disease unless properly treated, especially when atmospheric humidity, which is always an etiologic factor in this disease, handicaps the temperature-regulating function of the skin.

We have to deal with a vasomotor depreciation with enfeeblement of the cutaneous vascular area. In other words, we have here the same conditions to deal with as in typhoid fever, with the difference only that here we stand in the presence of dangerous heart failure in the inception of the case, whereas in typhoid fever this lethal condition occurs after the expiration of days of labor on the part of the heart to accommodate itself to the depreciated vasomotor action. This view affords us a key to the proper management of sunstroke, a management the correctness of which is established by the overwhelming superiority of hydropathic procedures directed to remedying the vasomotor failure over similar measures directed to reducing temperature, as has long and fatally been the practice.

Sunstroke, like typhoid fever, affords a valuable lesson in hydrotherapy because it illustrates the vital importance of individualizing the temperature, duration, and technic of water procedures in accordance with the therapeutic indications—a matter long insisted upon by myself, but still not sufficiently appreciated. So long as the bath in typhoid fever was addressed to the reduction of temperature, and the coldest bath was regarded as the most powerful, the shock from such baths and consequent failure brought them into deserved disrepute. Just as I have endeavored to rescue the correct procedure in this disease from fatal desuetude, I am now striving to restore the application of cold water to its rightful position as the most valuable agent in the management of sunstroke by exposing the fallacy of the reasoning referred to in the above statement. As in the case of typhoid fever, the author's views are clinically sustained by the most extensive and practical statistics on sunstroke management in the history of medicine. These were published in the Medical News of 1897 by Dr. Alexander Lambert, of Bellevue Hospital. They merit careful study.

There were 520 hyperpyrexia cases treated in the New York hospitals, with 132 deaths, all occurring during one

week in August, 1895. The treatment in the four hospitals is detailed with unusual candor, despite the fact that it places the author's own hospital second highest in fatality. Here is a lesson in hydrotherapy which cannot fail to demonstrate the fatal negligence of this subject which characterizes the medical profession and the importance of instruction in hydrotherapy in our medical schools.

Brooklyn Homeopathic Hospital.—Here the tub baths were used, beginning with water at 110° F., gradually reduced to 72° F. while the patient was lying in it. The number of cases was 49, with a fatality of 41.17 per cent. I cannot imagine a less rational procedure; the hot bath relaxing and destroying reactive capacity.

Bearing in mind my hydrotherapeutic law that intensity of action is primarily in proportion to temperature difference between the skin and the water, one must realize that no worse procedure than this graduated bath could be chosen. It is, unfortunately, a very common practice of those who are apprehensive of shock from cold water, in striving to avoid it, to order the patient to lie in warm water, open the outlet and the cold water faucet, and thus obtain a gradually cooled bath. Many adopt this method in fevers because they regard the patient as "too feeble to bear the shock." One would not use warm water gradually cooled for a morning ablution; the refreshing effect would be nil, whereas a sudden dash of cold water to the face accompanied by friction gives new life and vigor, without which the labors of the day would be irksome.

It may be claimed that after athletic exercises the most invigorating effect from a gradually reduced shower-bath is experienced, thus contradicting this explanation. But here we have quite a different condition. The individual is in perfect health, the heart acts vigorously, and all the responsive agencies of the organism are in the most active condition. Moreover, the water runs off quickly from the body; it does not continue to surround it as in

the tub bath. All of which demonstrates the great need of individualization in hydrotherapy.

Next in fatality is the *ice-pack*, which is described as follows¹: "The ice-pack was given by placing the patient on a rubber sheet and packing large pieces of ice between the legs and alongside the body. The upper surface was rubbed with the hands and with pieces of ice. This procedure often required more than an hour. The temperature almost always fell." The distress a patient must suffer while shivering in this arctic environment is obvious. No wonder it was fatal—38.7 per cent. mortality. What is the physiologic action of such a procedure? Wherever the ice was in continuous contact with the skin the latter doubtless presented that wrinkled condition called goose-skin, which means that all its muscular structures were contracted, with the result that the blood beneath was pressed out of the cutaneous muscular area; the heart, already enfeebled by high temperature and its resultant vasomotor depreciation, must labor hard to overcome this resistance at the periphery; unaided by the normal elasticity of the cutaneous structures it must succumb to the task. Despite the almost constant lowering of temperature 38 per cent perished.

Bellevue Hospital.—The ice-bath was used. "By the ice-bath," writes Dr. Lambert, "is meant a tub-bath in which ice, crushed into moderate sized pieces, is constantly kept floating. The temperature of the bath is about 40° F. Incessant and vigorous rubbing of every portion of the body is absolutely necessary. When the bath was given for ten minutes, irrespective of the height of temperature, the results were not good." No wonder that the mortality was 33.33 per cent. What is the reason? Here we have a greatly depreciated individual with high temperature immersed in water at 40° F. There is a temperature contrast of 65° F. between the skin and water, the largest and most fatal on record; the first effect

¹ Recommended in every edition of Dr. Osler's excellent text-book on Practice.

is a decided shock—an unpleasant surprise to the sensory terminals; there is a gasp, more or less embarrassed respiration, alarm if patient be conscious, and, if not conscious, a decided awakening to his surroundings. If the patient were removed at once, the effect would be a positive vasomotor stimulation, as is noted when a stillborn infant is suddenly dipped in cold water, or when very cold water is dashed upon a person who has fainted. If, however, the patient is detained in this very cold medium for several minutes or longer, which is incredible, the primary stimulating effect is so intensified that it becomes depressing from overstimulation; the nervous system, already depreciated by the prostrating action of high aërial temperature and humidity, plus muscular exhaustion, fails to respond to the *overstimulus*. Added to this is the contraction of the muscular tissues of the skin referred to. The muscular and elastic structures which abound in the skin act as substitutes in the capillaries for the muscular and elastic coats which control the caliber of arteries and arterioles. This contracted muscular stratum drives the blood out of the large network which ramifies in the papillary spaces, and the cold, being continuous and intense, constricts also the arterioles far more than any judicious hydrotherapeutist ever dares to advise or practice. The result is that the blood coursing toward the periphery fails to reach the large vascular area in the skin and superficial muscles in which abstraction of heat would be most active; *the antithermic effect aimed at is absolutely defeated*. Hence the large mortality incident to this procedure. It is not so fatal as the ice-pack because there is more opportunity for vigorous friction of the entire body, a procedure which stimulates the muscular and elastic structures and diminishes somewhat the chilling effect and cyanosis.

Flower Hospital.—Here the more rational cold spray was applied, with better result. The patient with an ice-cap on his head was placed on a rubber cot and sprinkled with water from the cold faucet from two sprink-

lers (the city water was probably 70° or 75° F.). When the temperature fell to 103° F. he was wrapped in two blankets; if it rose to 104° or 105° F. he was again sprayed until the rectal temperature fell to 101° F. Among 26 patients with a temperature averaging 108° F., 3 died—11.5 per cent.

Why this marvelous difference between the ice-baths just discussed and the spray of ordinary water without ice? The physiologic facts already stated furnish the answer. The application of water with friction, at a temperature 30 degrees below that of the skin, furnishes just enough thermic stimulation to arouse the vasomotor system without depressing shock. The latter is avoided by the evanescent exposure of the skin to the low temperature, and reaction is promoted by the friction with which the spray is delivered. Here we have thermic and mechanical excitation of the sensory terminals without reduction of temperature below the point of safety. This is the key to all cold-water procedures—individualization, recognizing the responsive capacity of the organism to the degree and duration of each procedure.

St. Vincent Hospital.—The management of sunstroke in this hospital, under the direction of Dr. O'Dwyer of intubation fame, was the most successful. The patient was wrapped in a cotton sheet and placed on a rubber stretcher previously covered with a cotton sheet. Dipperfuls of cold water were forcibly dashed on him from a distance of several feet. In very severe cases every two or three minutes a small stream of very cold water was allowed to fall 6 or 8 feet upon the forehead. This treatment proved powerfully stimulating, and was continued until the temperature fell to 103° F. The patient was then wrapped in blankets and surrounded by hot bottles. Of 197 hyperpyrexia cases, 6 per cent., died. In the light of the rationale of the action of water which I have taught, it is not difficult to explain why this procedure was successful in saving life. It is obvious that forcible dashing of cold water upon the skin covered with a sheet would pro-

duce at first the least abstraction of heat with the most thermic vasomotor stimulation. The patient, being wrapped in a sheet which is thoroughly saturated with cold water, enjoyed the advantage of a ready mode of abstracting heat *gradually* and of stopping the latter before it reached a dangerous point. Comparison of this practice with the ice-bath demonstrates why one was followed by a mortality of 33 per cent. and the other by a mortality of 6 per cent. It is a valuable lesson in hydrotherapy.

I advise the following procedure in sunstroke: Prepare a cot, low bed, or sofa by placing a rubber sheet upon it; cover with a sheet; raise the upper portion by placing two bricks or books under it; place a large vessel beneath the lower edge to receive water flowing from it. Now place a rolled-up blanket on each side, beneath the rubber sheet, so that a trough is formed; the head is also raised. Having prepared a vessel containing water drawn from the cold faucet and a supply of water also in another vessel in which a large lump of ice is floating; several towels, old sheet, and a pitcher, the patient may be treated as follows: If his pulse has lost tension and there are other evidences of vasomotor depreciation, an old sheet should be dipped in plain water, wrung out, the patient, placed upon the damp sheet, is snugly wrapped in it. Turning him over so that the back may receive dashes from a height—the higher, the greater the mechanical stimulus. Successive parts of the back are doused with a pitcher from a height of 6 feet or more, not, however, passing beyond the knees, the water temperature ranging from 70° to 60° F., as required. The wet sheet is now rubbed with the flat hands by two or more attendants until it feels warm. Now a smaller stream of ice-water is poured with force upon the warmed portion of the back; this is rubbed and slapped with the hands until it ceases to warm up before another is treated. (See Sheet Bath, page 45.) The entire posterior part of the body having been doused, rubbed, and again doused until the hands feel little warmth, the patient is turned over and the anterior portion is treated in a similar manner, first by

water at ordinary temperature, then with ice-water in smaller quantities, followed by vigorous rubbing and slapping. The patient is then dried and wrapped in blankets with hot-water bottles to the extremities. In half an hour the rectal temperature should be taken; if it has fallen three or more degrees, the patient may rest for another half-hour with a cold turban around the head. If the temperature has not fallen several degrees, treatment must be resumed.

In obstinate hyperpyrexia the O'Dwyer method merits first trial. It will be a decided advantage to remove the patient to another cot previously covered by two blankets and to leave him, unless he is shivering, snugly wrapped in the wet sheet in which he has been douched and rubbed, enveloped in the blankets as in the wet pack (page 58) so that he resembles a mummy. He will probably fall asleep and awake refreshed, with a lower temperature. In cases of hyperpyrexia it is unsafe to allow the temperature to fall below 102° F. while the patient is under the treatment. In cases of a temperature of 100° to 103° F. this treatment will not need to be so energetic, the sheet bath alone sufficing. The chief guide must always be the *reaction*, which implies that the patient must not shiver long and his lips and nails must lose cyanosis and the pulse regain tension. When reaction is feeble or absent the affusions must not be abandoned, but be more brief. The lower part of the body should be treated by active friction with warm woolen cloths or with the hands, and wrapped in warm blankets, while the upper chest and back are rubbed and slapped with ice-water so long as they warm up under the treatment. Quite as much depends upon the duration and extent of exposure to cold water as upon the temperature. Success or failure will depend upon cautious attention to detail in this as it does in other branches of practice. Extremely cold prolonged procedures must be avoided.

These clinical records demonstrate that a judicious application of water results in the saving of life, and an irrational use results in increased mortality. They are

offered as a lesson in hydrotherapy as obvious as it is instructive.

That the medical mind appears to be slow in accepting the best established clinical facts is sadly demonstrated. Twenty years after these comparative statistics were *published* the Superintendent of Bellevue Hospital told reporters that the ice-bath was the best method of treating sunstroke, according to his personal observations. This brings to mind the lament of Hippocrates—"Life is short, art is long, judgment difficult."

PNEUMONIA

Conservative writers and speakers have insisted that the prognosis of pneumonia remains unaffected by any method of treatment. The great fatality of influenza-pneumonia has recently appeared to confirm this view. That *this pessimistic view is incorrect* has been demonstrated to my satisfaction by personal experience which extends over a period of half a century, during which my methods have passed from the antiphlogistic attack on the disease through all modern "improvements" until I have reached the present very satisfactory plan. Before detailing the latter it may be profitable to cite from four articles by medical teachers their practice for comparison with the author's method and results.

No. 1 insists upon heat and ventilation, regards hot flax-seed poultices of great service, sponges the body twice a day with tepid water, never uses antipyretics, and feeds the patient every second or third hour. He opens the bowels with calomel or castor oil, and mentions as more or less useful the following drugs: Large dose of quinin hydrochlorid intramuscularly, opium, camphor, digalen, musk, cocain, epinephrin, atropin, pituitrin, caffein, strophanthin, apomorphin, ipecac, ammonium iodid in a pepsin vehicle, injections of iodid in vasogen, iothion in olive oil, Bered-ska's pulmonary autogenous vaccine, and mercurial inunction in extreme cases!

No. 2 advises in bronchial and lobar pneumonia rest,

water in abundance, and a gradually increasing feeding; exposes the patient while the body is kept scrupulously warm to outdoor life, moving air, which he very properly regards as a stimulant to the vasomotor centers, keeps the bowels open, regards fever as not to be treated except when imperiling the vital centers. Hyperpyrexia is to be combated *not by drugs but by cold water*. How applied he fails to state. He gives caffein, camphor, or digitalis early, in 20 to 30 mgm. doses.

No. 3 insists upon good nursing and hygienic conditions and replaces the windows by cheese-cloth or rugs. He uses, as occasion demands, guaiacol, quinin, spartein, hexamethylenamin, aspirin, digitalis, strychnin, camphor, oxygen, also vaccines, ice-caps for delirium, whisky, occasionally sponging for high temperature with water at 98° F., gradually reduced to 65° F., allowing it to evaporate.

No. 4 bases his conclusions on the records of one of the largest hospitals in Philadelphia in which medical students are taught. In lobar fibrinous pneumonia he claims recovery is approximately 75 per cent. He exposes the patient outdoors, protected thoroughly in a woolen sleeping bag, except the nose and mouth; regards drinking water as an essential, "not less than 3 pints in twenty-four hours and as important as fresh air." Sweeping the intestine every second day with castor oil is valued; *sponges with hot water morning and evening and at regular intervals, at as high temperature as the patient prefers*. *Regards the hot sponge bath as a cardiac tonic*. Recommends hot turpentine stupes of fifteen minutes' duration; dry cupping once a day; hot foot-baths are of advantage. Hypodermoclysis is condemned because "we should spare the cardiac muscle the additional burden of an overquantity of fluid in the circulation." Occasionally he applies an ice-bag to the precordium, sometimes over a blister, to quiet the heart. Although he claims that many patients would be better without than with extensive drug treatment, he mentions as more or less applicable hypodermics of atropin as a cardiac tonic, maltine and morphin for the

cough and restlessness and to quiet the heart; pilocarpin for skin elimination; strychnin; digitalis, spartein, camphor, ammonia, and a calcium salt "may be employed without expecting too much of them." Alcohol he regards as a vasomotor paralyzant. He writes, "If treatment is conducted along these lines recoveries should occur in vast numbers in healthy persons." The author concludes: "There is no question that many pneumonia patients are hurried if not helped into the grave by over-treatment. 'Purging, diet, and bathing' were the watch-words of Asclepiades. Add both warm and cold air to this triad and we shall have the outline of the most successful modern treatment of one of the most treacherous and dreaded forms of systematic and pulmonary disease." His statistics do not bear him out. "Total number of cases from 1911 to 1913, 596; deaths, 364; mortality, 61.3 per cent.; number of cases with temperature not over 100° F., 393; number of cases typically febrile, frankly croupous, 203. The majority perhaps occurred in alcoholic subjects. Practically every case was treated in cold fresh air; very many on bridges constructed for the purpose."

These statistics certainly do not justify the author's optimistic attitude, for they present the *second highest mortality* I have encountered in the literature of the subject. *The results would have been different if his practice followed the principles enunciated in his conclusion, as I shall show.*

The reader has here a picture of the present unsatisfactory status of pneumonia management, because the methods advocated in these articles differ in nowise from those recommended in the average text-book or society discussion:

1. All *claim* to treat the patient instead of the disease. This is a great advance over the spoliative methods, which in the antiphlogistic period of medicine killed the patient or brought him out of bed in a damaged condition. It is a great advance also over the antipyretic method, which

only permitted the patient to die with a lower temperature than formerly.

2. *Food*.—Upon this subject most authors agree also. I would protest against overfeeding, especially in croupous pneumonia. We must guard against the not infrequent distention of a paretic intestine. Since the attack is usually ushered in suddenly in a healthy individual and its duration is limited, feeding is of less importance than in typhoid fever.

3. *Drink*.—Water in abundance is advised by two writers. One author advises "at least 3 pints daily, but in another part he properly warns against hypodermoclysis," because "we should spare the heart muscle the additional burden." I am convinced that not the *quantity* but low *temperature* of water stimulates the emunctories and does it through vasomotor enhancement. Guided by ample bedside experiment I prescribe 1 ounce of ice-water, not above 40° F., every hour. A few drops of diluted hydrochloric acid added impresses the importance of the ice-water, the quantity of which taken and retained should be recorded. The result is abundant diuresis.

4. *Fresh Air*.—Pneumonia, like most infectious diseases, demands not only fresh air, but, as one of these writers has well expressed, *cold moving air*, if it can be obtained. The reason is doubtless to be found in stimulation by the cold-air current of the sensory terminals in the skin of the face and the mucous membrane of the nasorespiratory surfaces, as has been proved by the interesting experiments of Fluegge, Leonard Hill, and Henderson of Yale, who found stirring air with a fan of great value to counteract inadequate ventilation. I prefer a good fan in a room to exposing the patient outdoors, because the latter would exclude the application of another and better vasomotor stimulant to be presently referred to. In the summer the sashes of one window are removed and the latter closed by blinds, which may be kept more or less open according to the individual requirements.

5. *Medication.*—My preference is for calomel in 6- to 10-grain doses dry in the mouth and washed down after rinsing. It destroys the pneumococci in the mouth and removes all fermenting or toxic material from the gastrointestinal tract. This is my only drug and it is not repeated. The mouth is rinsed with a saturated solution of potassium chlorate every hour. The polypharmacy of some of the above-mentioned writers will, I trust, not find imitators. Heart stimulants were rarely required in my cases treated early. Later they only serve to spur the heart beyond its capacity, which wears it out. The myocarditis of some observers is often a manifestation of heart fatigue. In consultation cases they have sometimes served a good purpose. I do not remember a case saved by them except when alcohol is needed by alcoholic habitués whose nervous system requires a filip. Strychnin has been shown by Cabot to be inert in heart failure.

6. *Antipyretics.*—Happily, the coal-tar preparations are no longer dominant in pneumonia. I should not hesitate, however, to order one dose (8 grains) of antipyrin in a case of insomnia with unyielding high temperature, to tide over the danger. Aspirin in 15-grain doses, as advised by some, would, in my view, handicap the heart, as also large quantity of water.

“Hot water sponging as a heart stimulant and sponging with water at 98° F., reduced to 65° F., and allowed to evaporate for reducing temperature” does not appeal to my hydrotherapeutic sense.

For hyperpyrexia with nervous symptoms there is no procedure equal to a tub-bath of 90° F. of half an hour's duration, the patient being afterward wrapped in a linen sheet and allowed to dry in bed. In most cases of pneumonia of children a ten-minute friction bath at 95° F., rapidly reduced to 90° F., answers all purposes. If pleurisy be present the tub-bath must be avoided.

The best article of this series states, “hyperpyrexia is to be combated not by drugs but by cold water.” But the author fails to furnish temperature, duration, or method

in which cold water is to be administered for the purpose indicated, and herein he is not singular. I have heard a justly eminent pediatricist say, *after entering into the most minute details about the drugs* he prescribed in pneumonia, "Whenever the temperature reaches 103°, 104°, 105°, or 106° F. I give cold baths and packs." He said not a word about the temperature, duration, and frequency of repetition of the baths; when, the fact is, that in New York City the water supplied by the cold faucet is about 45° F. in midwinter and 75° F. in midsummer. I have never dared to give a child a bath even of 75° F. in pneumonia. This eminent man naïvely confessed in this address that he was asked to resign because of his penchant for cold baths.

The profession is happily beginning to accept my contention of the past twenty-five years that water of low temperature is useful in fevers for its vasomotor, stimulating action rather than for temperature reduction. *I plead for the same idea in other acute and chronic diseases.* Its recognition would insure more recoveries from *pneumonia*, sunstroke, and tuberculosis, and more rapid improvement in neurasthenia and other neuroses.

7. Local Applications.—It is surprising to find hot flaxseed poultices, dry cups, and blisters mentioned in modern treatment. While I do not deny their efficacy in the hands of my colleagues, I wish that they had given indications for them more definitely.

Chest Compress.—The only local application that I constantly use is the wet compress at 60° F., applied around the chest every hour, after it has become warm. This is made of three thicknesses of thin or two thicknesses of heavy old linen cut to fit the thorax snugly and to cover the entire chest from the nucha and clavicle to the last rib. It is wrung out of water of 60° F., spread upon a piece of flannel cut in the same shape (pages 70 to 73), but 1 inch larger, one-half of the flannel and damp linen is gathered into a fold, the other spread on the bed; the patient turns on one side, the folded part is placed next

to his side, so as to reach the nucha at the top; the patient is asked to turn on his back. As he turns upon the outstretched portion of the compress his arms are raised, the folded part of the compress is drawn from under him, and is quickly thrown over the chest to meet the other half; the upper flaps are brought over the clavicle, the flannel is wrapped over the compress and secured by safety-pins in front. The patient now lies in a snug cold vest, as it were. The rationale rests upon thermic excitation of the cutaneous terminals, which is conveyed to the central nervous system and reflected upon the heart and lungs, improving the pulse and deepening respiration. In five or more minutes the temperature of the compress is equalized with that of the skin, gradually the linen warms up, and very soon the patient lies in a moderately warm poultice. If oiled silk were used as a covering of this compress it would become a hot poultice. To avoid the relaxing effect of the latter a flannel covering is used, which permits escape of heat and moisture by capillary attraction, which favors the cooling process. When the compress is found warm on examination with the fingers, after the lapse of an hour, another is prepared before the first is removed. This hourly envelopment of half the trunk in water 40° F. below that of the skin produces the following striking therapeutic effects (pages 69, 70):

As the four-hourly cold friction baths prevent heart failure in the toxemia of typhoid fever, so does the hourly colder but more evanescent wet application in the toxemia of pneumonia. This is proved by the improvement in the tension and rate of the pulse. The pulmonary circulation is probably affected directly, in view of the fact that its vasomotor supply is derived from the second to the seventh dorsal ganglia, which are connected with the epigastric and scapular reflex area in the skin. The latter are covered by the chest compress when properly made, not otherwise.

In the toxic forms of pneumonia the hourly stimulation of the central nervous system is evidenced by a brightening of the countenance and disappearance of

dulness of intellect. Intelligent patients have referred to a longing for the time of renewal of the compress. Alcoholic or other stimulants have become unnecessary in cases seen early. In consultation cases I have been guided by the temperature, toxemia, and pulse in lowering or raising the temperature and duration of the compress, according to the hydrotherapeutic law that "intensity of action is in proportion to the difference of temperature between the skin and water." For instance, in the desperate case of Dr. J. H. D., whom I had the privilege of seeing with Drs. W. A. Ewing and A. A. Smith, the dulled intellect and depreciated vitality demanded a colder compress and more brief application. Dr. D. told me after his recovery that the compress had aroused him from stupor and that he did not remember my having visited him and applied the compress.

In infectious fevers the urotoxic coefficient is increased fivefold by cold baths according to Hewetson, of Johns Hopkins Hospital, and others. That there is an enormous increase in the quantity of urine (ranging from 70 to 110 ounces) when small quantities of ice-water are used in connection with the regular cold chest compresses is easily demonstrated. If the measurements had not been made by trained nurses they would be incredible.

An ordinary rise of temperature does not require treatment. The chest compress at 60° F. has served me well in maintaining a safe temperature. Its antithermic effect may be considerably enhanced by permitting as large a quantity of water to remain in the linen as would not interfere with the patient's comfort by dripping and chilling. In this manner more heat is abstracted and more water is evaporated by capillary attraction, through the meshes of the flannel cover. Extra towels are necessary under and over the compress to prevent the sheets becoming too damp.

Experiments made by myself in the Hydriatric Institute and by the house staff of the Montefiore Hospital have demonstrated that cold applications to the large skin sur-

faces increase the number of white cells in blood drawn from the lobe of the ear, showing that they have been driven from stagnant points into the circulatory current where their phagocytic action may become more effective.

Hektoen concludes a recent able article, "That the leukocytes constitute an integral factor in the defensive mechanism of the body against the pneumococcus must be accepted as settled."

Reduction of Mortality.—This outline of management of pneumonia patients represents a practice of thirty years. When I compare its clinical result in saving life, enhancing comfort to the patients, nurses, and myself, I am impelled to urge its adoption. True, one must not follow blindly the dictum of any one in medicine, but when remedial agents are explained upon a scientific rationale, and the results are far more favorable than they are under other methods, their acceptance is rational.

After all, the clinical proof is the crucial test. The results in private practice are usually not recorded except in the mortuary statistics of the registrar. I may say, however, that the latter will show but 2 death certificates from pneumonia written by myself in the twenty active years before I relinquished general practice, one being an elderly alcoholic and the other a woman seen on the third day of her illness with a temperature of 105° F., and almost collapsed from the effect of enormous self-prescribed doses of Epsom salt.

Of the number of cases I have treated while in general practice there is no record, but I may safely claim an average of several hundred.

Hospital statistics, on the other hand, are not always fair guides, because most cases enter several days after beginning of attack and have received medication usually; others are almost in articulo mortis. Nevertheless, a comparative test may be made between the statistics of hospitals. While visiting physician to the Knickerbocker Hospital a search of the records by Dr. A. J. Wittson revealed the fact that before the general adoption of the wet

compress the mortality from pneumonia was 66 per cent.; after its adoption 156 cases showed a mortality of 33 per cent., while in the cases living till the fifth day the mortality was 12 per cent. When the fact is considered that these patients came from the lower types of tenements—Italian, Irish, and American, most of them habitual consumers of alcohol or actual drunkards—the result may be regarded as favorable. Compared with the 61 per cent. mortality reported in one of the articles quoted, and with the fatality of influenza-pneumonia, this record is encouraging and points to far better achievement in private practice. Confirmation of my claim is found in reports by two military surgeons who used practically the same method. Staff Surgeon Schichhold, of Dresden, records in the Medizinische Klinik for 1906 a series of 200 cases of pneumonia among young soldiers, with a mortality of 3. Dr. Nepor, an Austrian army surgeon, reports 90 cases, with a mortality of 1.

That the management here outlined is also valuable in desperate cases is evidenced by 4 cases. One, Mrs. DuB., seen in consultation with Dr. E. H. Rodgers, a diabetic woman of sixty-five, with grip, pneumonia, and acetonuria. The others were colleagues who had been under skilful and sympathetic care of friends. Dr. J. H. D.; seen with Dr. W. A. Ewing, Dr. W., with Dr. Palmer Cole, who published the case in the Medical News, the third, Dr. B., seen with Dr. A. Herff, of San Antonio, Texas, where I happened to be sojourning on my way to California. All had received the conventional treatment without result until the wet compress was applied as a last resort in accordance with the indications presented by each case. All were regarded as hopeless.

That judicious systematic management of the pneumonia patient will change the prognosis of pneumonia as surely as it has changed the prognosis of typhoid fever I doubt not in the least. To hasten this consummation I present such a method, the result of observation of half a century. The reader is counseled not to adopt it unless

he follows it with precision of technic. Modifying it will as surely fail as deviation from correct technic for asepsis.

PULMONARY TUBERCULOSIS

There is no disease in which the addition of the external use of water contributes so largely to the successful management as in pulmonary tuberculosis. It were an act of temerity on my part to make this positive statement were it not capable of absolute demonstration by properly recorded institution records.

While clinical results, as has been frequently referred to in this work, are of paramount importance in the estimate of a remedial agent, the value of the latter as a guide for others is enhanced by a rational explanation of its action.

In his early practice it was the author's custom as a general practitioner, living in a southern town which has become a health resort, to manage pulmonary tuberculosis by free exposure to the open air, proper diet, and guarding the patient against active exertion in febrile conditions, the method which was so well planned by Alfred Loomis and Trudeau. About the year 1876 I learned from Ziemssen's lectures the value of cold-water rubbings. The improvement of appetite, digestion, and general tone in the few patients at that time accessible to me was so marked that the prejudice inculcated by my teachers against cold water in this disease was slowly but surely removed. When a few years later I became the Medical Director of the Montefiore Home for Incurables (as it was then termed), where the large majority of cases were tubercular, I did not hesitate to add hydrotherapy to the management of these cases. In fact, the first record in this country of carefully observed cases of pulmonary tuberculosis under graduated water treatment was gathered under my direction as chief of the medical staff of the Montefiore Home for Chronic Invalids and Hospital for Consumptives. Some of the results attained in these cases were published in the Transactions of the New York

State Medical Society for 1892. They may serve as examples of judicious hydrotherapy in this dread disease, so far as improvement of nutrition is concerned, for these were poor people from the toilers of the tenement districts in the most desperate straits, the conditions for admission requiring absolute poverty and incurability. The record sustained every statement by bedside facts, citing cases in all stages of the disease. In some of these the improvement in nutrition, gain in weight, and general vigor was phenomenal, resulting in return to their vocation in some instances and even in remaining capable of work while under observation for several years. The patients were under constant observation of members of the staff of 18 physicians; their sputum was examined by Dr. Hodenpyl, pathologist to several hospitals; there was no possibility of error. In few of them, and I want particularly to emphasize this fact, did the open-air treatment, properly regarded as the most potent of all anti-tuberculosis remedies, play a rôle. For, despite the fact that in the planning of the building I had insisted upon a costly and perfectly equipped rest room, heated in winter and opening to the south, it proved impossible to induce these desperate people to submit to discipline by reason of the mistaken kindness of the directors, whose chief aim was claimed to be to soothe their dying days. Nor did I interfere with the (to my mind) inert medication (creosote, etc.).

In view of these facts I feel warranted in claiming that the favorable results were attributable chiefly to the methodic application of water, and to the good, wholesome food, *for which they displayed no desire before* their subjection to tonic hydrotherapy. Many of these people had, previous to admission, been treated *secundum artem* in our best hospitals and by competent private physicians, often with consultants. Water was the sole exception in their management, because it was at that time regarded as obnoxious in pulmonary ailments. The almost invariable outcome in these cases was improvement of the

circulation, increase of appetite and consequent enhancement of nutrition and hematosiis, together with increased excretions. All these favorable results were attained without fatigue and its accumulated products of retrograde tissue change. *The most precious action of cold water in this connection is to elevate the resisting capacity of the organism to the inroads of this as of other depreciating maladies.*

This is precisely what the successful modern physiotherapy of the disease aims to achieve.

The therapeutic indications in the management of this disease are summarized by Osler as follows: "The cure of tuberculosis is largely a question of nutrition; digestion and assimilation control the situation—the prognosis depends on the digestion—the physician should never forget that in tuberculosis the primæ viæ control the situation." The so-called open-air treatment appears to be the modern method of meeting this paramount indication. In the evolution of phthisiotherapy the removal of dread of cold air long existing in the minds of the medical profession and lay people has played the most important rôle. Despite the fact that the originator of this improvement (Brehmer) also advocated the external methodic application of cold water, the latter has not become so universal as the use of cold air in countries outside of that of the originator. In German sanatoria cool and cold water is systematically applied with great advantage. The author is convinced that the action of fresh air is based upon the same rationale as the action of cool or cold water upon the skin. While there is no doubt that the air is more refreshing outside of the dwelling than in a close room, the difference is not sufficiently great to account for the enormous advantage derived by consumptives from the practice of living outdoors. There is another reason for the refreshing effect of the latter.

Recent investigations of ventilation have demonstrated that the deteriorating effects of rebreathed air are not due to diminution of oxygen or the increase of carbon dioxid,

nor to the deleterious infective material possibly contained in it, but to the heat and moisture eliminated by crowds, and that stirring the air with a fan (Leonard Hill and Yandell Henderson) counteracts the injurious effects.

The author has explained the favorable effect from exposure of pneumonia patients on porches to be due to vasomotor stimulation by the impingement of air currents on the face and mucous membranes. Exactly the same principle obtains in the action of cool or cold water impinging upon the skin as has been shown; the difference, however, being that exposure of the face to cool *air* may be prolonged indefinitely, while exposure to the cool *water* must be brief and repeated. On the other hand, the latter affects the vastly larger area of sensory terminals in the skin, and for this reason offers a far more potent influence in this direction.

The *combination* of air and water, both acting on the same rationale, with gentle exercise, or in febrile conditions in recumbent posture, is much superior to air exposure alone. Judging from clinical observation, improvement is enhanced 50 or more per cent. The author is convinced that in febrile conditions precluding exercise a judicious application of cool water evokes all the favorable effects of exercise without the deleterious effect of exertion.

In the early stage of this disease simple rubbing of the trunk with a bath mitten or a towel wrung out of water at 90° F. and *reducing the temperature of the water one degree at each treatment*, so long as the patient does not complain of chilliness after he is dressed, is the most useful procedure. It should be given or taken by the patient himself just after he steps out of a warm bed into a warm room. The towel is grasped at each end and passed to and fro over the back in both directions, with several renewals of the cold water wringing of the towel. A warm room is essential to promote reaction. The entire trunk should be treated, the extremities being omitted.

The next procedure is the affusion: the patient sits or stands in an empty tub and squeezes a large sponge

soaked in water at 90° F. successively over nucha, chest, and each shoulder. *Water temperature is reduced daily.* Later duration is increased by increasing the number of saturations of the sponge.

When the patient is unable to treat himself the following procedure is useful: Sitting in an empty tub in a warm bathroom, he receives a pitcher or basinful of water at 90° F. dipped from a nearby vessel, over the front and back of the chest and the sides. The temperature is diminished one or more degrees at each treatment, which may be given twice a day. The patient should go into the open air after treatment. The water temperature should not go lower than 70° F. When this point is reached it is more effective to double the quantity of water used than to reduce its temperature, because a longer treatment prolongs the effect. Colder water would be more stimulating, which is to be avoided; an enduring tonic action is more desirable. (See Affusion, page 47.)

In institutions having a large number of cases to treat, water may be applied with the circular or fan douche (see page 132). This has been for many years used in the Montefiore Hospital and Sea View Hospital for Tuberculosis. The pressure should not be over 20 pounds because it would then be too stimulating. The patient is ordered a warming in the hot-air cabinet short of perspiration before he is subjected to the douche, with a view to producing hyperemia of the skin, which enhances reaction besides precluding the need of very cold water. Figure 35 represents a simple apparatus especially designed for neurovascular training.

The almost invariable effect of these procedures in the home or in the institution is the same as that of gentle exercise. There is freer oxygenation of the blood; there is an improvement in the quality of the pulse; an enhancement of general vigor, promoting a desire for exercise, as far as it is allowed by the physician, but the chief effect of this treatment has been, if I may judge from a very large observation, the improvement of the ap-

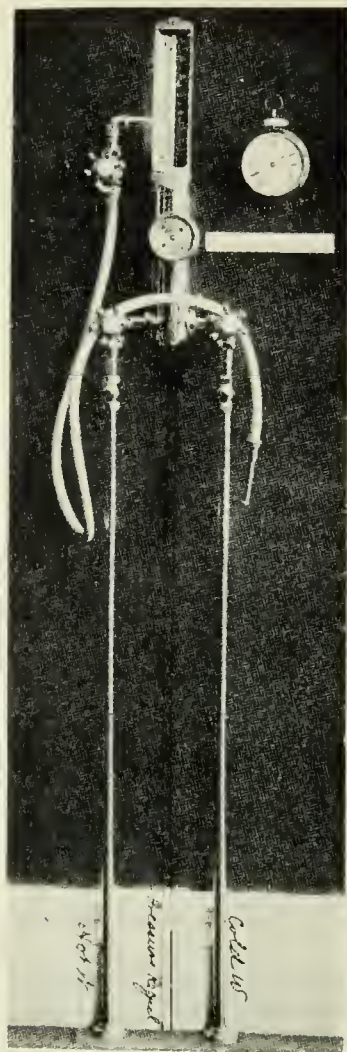


Fig 35.—The author's simplified apparatus for neurovascular training. (Courtesy of Hydrotherapeutic Apparatus Co.)

petite, digestion, and assimilation, all of which conduce, of course, to the enhancement of nutrition which is aimed at by those who have the largest experience in this disease, as the *sine qua non*.

The reader is referred to numerous histories from the records of the Montefiore Hospital for Consumptives, some of which are detailed in my work on Hydrotherapy (3d edition, pages 416 to 421). My latest records are from the Sea View Hospital for Tuberculosis published in the Report of the Department of Charities of New York City for April, 1917, from which I quote:

"I am indebted to our Superintendent, Dr. McSweeney, for a detailed statistical statement of 69 cases which have received neuro-vascular training (douche treatment): 13 being the first stage; 53, second stage, and 3 the third stage. From these I have condensed the necessary data, as follows: Among the first stage cases, $43\frac{1}{2}$ pounds were gained and 4 pounds lost; among the second stage, $148\frac{3}{4}$ pounds were gained and $27\frac{1}{2}$ pounds lost, and among the third stage, $7\frac{3}{4}$ pounds were gained and $4\frac{1}{2}$ pounds lost.

"Since the above was written I have received another list of 63 cases, stating name and weight, from Dr. McSweeney, showing that in 45 second stage cases there was a total of 581 pounds (average gain per person $12\frac{4}{5}$ pounds), the highest gain being $56\frac{1}{2}$ pounds and the lowest 1 pound; among 18 third stage cases there was a total gain of $174\frac{1}{2}$ pounds (average gain per person $9\frac{3}{8}$ pounds), the highest gain being 25 pounds and the lowest 1 pound.

"In order to render these statistics absolutely reliable I asked Dr. McSweeney to make a careful investigation of the weights prior to *beginning hydrotherapy*, because I was surprised to discover that most of the cases had gained considerably between the date of admission and the date of beginning hydrotherapy. This fact would naturally invalidate the favorable result shown by the statistics in improving nutrition. I made a special visit to the hospital to discuss the matter with Dr. McSweeney. He suggested the following explanation, which I asked him to communicate to me in writing, as follows:

April 17, 1916.

"Dear Dr. Baruch: I beg to give you below the memorandum which you asked for:

"Patients have, almost without exception, not begun bath treatment until after the usual initial period of weight gain and improvement was over. Practically all cases but those rapidly advancing to a fatal termination show this favorable reaction on first coming to the hospital. Again, almost without exception, they have been chosen because, despite the usual hygienic dietetic measures, *they had ceased to improve or were losing ground*. Under these conditions

weight gain represents much more in these patients than in others, and a small gain is often more equivalent to the larger ones shown by the more favorable types.

"There are, again, many cases who have shown no gain, or even a loss, under the usual treatment up to the time that baths were begun, but have responded well to the tonic effect of the water.

"Patient, Rose Mesagros, treatment for two months without any effect, in the following eleven weeks under bath treatment gained 5½ pounds weight.

"Patient, Joseph Greenlish, in sixteen weeks' treatment has lost 2 pounds. In the following fourteen weeks under bath treatment had gained 4 pounds.

"Patient, John Beatty, in thirteen weeks' treatment had lost 6 pounds. In the following twelve weeks, with baths, he gained 2¼ pounds.

"Patient, Edmund Owens, in two years' treatment had remained stationary. In three weeks with the baths he had gained 3 pounds."

Sincerely,

(Signed) E. S. McSWEENEY,
Medical Superintendent."

These results were obtained and are only obtainable from *systematic* application of water. That the latter is not in common use is evidenced by the fact that when I recently urged upon an eminent specialist to teach systematic hydrotherapy to his contemplated students, he replied that he "had no doubt of its value when rationally applied and that he is himself in the habit of directing his patients to *wash themselves in cold water every day*." Such indefinite prescription may be useful in the hands of an expert, but the average nurse requires definite directions with regard to duration, temperature, and method of procedure for which there are many better ones than to "wash with cold water."

The above data are cited at length because the author hopes thereby to remove the prejudice still existing against hydrotherapy in pulmonary tuberculosis. For example, a recent otherwise good American work on tuberculosis of 300 pages states, "A well selected tonic medicine is worth incomparably more than baths"; another, consisting of contributions by American authors, dismisses water with a few vague lines on "cold baths for hardening" and "mustard foot-baths and sponging for temperature

reduction." No text-book contains the principal therapeutic action of water, *i. e.*, enhancement of nutrition and of general stamina and of resistance to infection emphasized, as was done by Brehmer, the author of Modern Phthisiotherapy, who gives careful directions for douches in this disease, and warns against their excessive use.

This prejudice was most flagrantly exemplified when on visiting a public sanitarium several years ago, and noting its fine arrangements, I offered the medical superintendent the gift of a douche apparatus if he would agree to test it on a number of control cases by adding systematic neurovascular training to his treatment, and compare the results with and without hydrotherapy. He declined the offer. This latter was inexplicable to me until several years later the newspapers published an epidemic of malignant sore throat in this institution, claimed to be due to an infected dairyman—the milk not being pasteurized until *after* this discovery. This colleague lacked broad-mindedness.

In conclusion, I would call attention to a hydriatric procedure commonly in vogue for the suppression of pulmonary hemorrhage, *i. e.*, the ice-bag. I cannot conceive of a more irrational idea than the expectation of constricting the ruptured pulmonary vessels by ice applied over the chest:

1. The bleeding point is rarely positively known.

2. It is impossible for cold to penetrate sufficiently to constrict the bleeding vessels, so long as there are intervening tissues through which the warm blood is coursing.

Experiments on animals, into whose rectum a thermometer was placed so that ice could be applied over the point showing the position of the bulb, have demonstrated the failure of this idea.

There is no doubt that bleeding often stops after these applications, but every experienced physician has seen bleeding stop without them if rest and immobilization of the chest are practised.

NEURASTHENIA

Under this generic term have been recognized certain manifestations indicating physical instability, the management of which has often been unsatisfactory, because the underlying etiologic factors have escaped recognition. It is not the province of the author to enter into the diagnosis of this multiform malady; suffice it to insist that a careful examination for the purpose of ascertaining the cause of this condition is all important. It has been my observation that when mental disturbances, either exciting or depressing, have been ascertained to exist, the disease must be treated as a psychosis. Nevertheless the addition of neurovascular training has proved of great value in the author's hands whenever there has been found a depreciated or faulty physical condition connected with the mental instability.

I have divided these cases into the excitable, depressed, and intermediate types. In the first type very cold water and very strong pressure must be avoided. A tub-bath at 100° F. for fifteen or twenty minutes at bedtime, the patient being wrapped in a previously heated sheet and dried in bed, is useful in allaying irritability and furthering sleep. In the morning such patients may be treated by sitting in a tub containing 18 inches of water at 105° F. Having a small vessel containing water at 90° F. at hand, a sponge is dipped into it. Pressure of the wet sponge from which cool water flows successively upon each shoulder, the nucha, and the chest produces a mild stimulation of the cutaneous nerves, which arouses the patient sufficiently, if followed by gentle friction, to enjoy the morning walk before breakfast. The temperature should be daily reduced, but not below 90° F. When this is reached the quantity of water used for these ablutions should be doubled.

Second: In the depressed type of neurasthenia the object of hydrotherapy is to arouse the central nervous system from its lethargy and to improve the general physical condition. For this purpose neurovascular

training is of great value. Because of the ready discouragement of these patients it is important that a gradual introduction into the water treatment be practised. When the prescription is tonic, the treatment described on page 132 is here of great value. It will be noted that stimulation is added to the tonic effect by using the jet douche in connection with the fan douche, at the same or lower temperature, prior to concluding the procedure. The pressure of the douche may be increased 1 pound every day until 30 pounds are reached, since mechanical excitation is thereby added to the thermic. The temperature, duration, and pressure must be regulated in accordance with the object in view, whether tonic, stimulating, or soothing. This applies especially to the intermediate type of neurasthenia. Especially is this discrimination demanded in neurasthenia, which manifests itself in connection with other maladies. When the latter are prolonged, unduly trying, or regarded as intractable, the patient naturally becomes depressed, with the result that psychasthenia becomes pronounced and handicaps the physician in his effort of restoration. For example, among gastric diseases commonly termed "*dyspepsia*" those characterized by hyperacidity occurring in high-strung individuals who bear large responsibility, as well as in those who pursue fortune or fame in the centers of civilization without adequate results, general tonic hydrotherapy is more useful than local treatment. In these cases very cold procedures must be avoided. Baths of 100° F., followed by a pitcher of water at 85° F., not below 70° F., over the shoulders every morning are very serviceable procedures.

The trunk pack at 70° F., applied every night at bedtime and worn until morning, is indicated. It warms up quickly and becomes a soothing application. In gastric catarrh with hypo-acidity, on the contrary, the patient is prone to mental depression, which the ancients characterized as hypochondriasis. In these cases lavage is necessary (see page 142), but a general tonic procedure,

gradually reduced to 60° F. if well borne, is of the utmost service.

In *diabetes mellitus* neurotic manifestations are very common: neuralgias, headaches, vertigo, insomnia, etc. These cases are usually of the depressed type by reason of unpromising prognosis, enforced dietetic measures and other deprivations, and the general debility that renders life intolerable. The author has experienced the most satisfactory help in these cases from judicious hydrotherapy, neurovascular training to the point of toleration. Especially profitable is a systematic douche treatment in institutions. The enhancement of appetite and nutrition and increase of weight encourage the patient and induce him to throw off the oppressive lethargy by reason of the refreshment following cold procedures with good pressure. The author has observed a complete change for the better in otherwise unpromising cases when the patient began to cautiously take exercise without fatigue. He is in the habit of allowing a slice of longed-for wheat bread as compensation for certain definite exercise.

In *cardiac diseases* neurotic manifestations are frequently encountered that handicap patient and physician. Mild procedures are indicated. Gentle friction with damp soft cloths wrung out of water at 85° F. every morning and evening do not interfere with other treatment, but refresh the patient and add to his cheerfulness.

In spurious *angina pectoris* many surprisingly satisfactory recoveries or partial recoveries have been observed by the author after the patient had been sent away with unfavorable prognosis by capable colleagues. (The author confesses to opposite errors.)

A differential diagnosis is of great importance because hydrotherapy is not adapted to true *angina pectoris*. Scrutinizing inquiry into the appearance of the patient during the paroxysms in order to ascertain if the countenance was anxious, face pale, and the discovery without leading questions of the direction in which the pain is diffused, whether to the left or right, or into the left arm,

may usually lead to a correct estimate of the case. If the face is not anxious and pale and the direction of the pain is toward the right or the back, we probably have a case of spurious angina, especially if the attack follows a meal with gaseous eructations.

In these cases a properly adjusted diet together with judicious tonic hydrotherapy will often bring recovery to patients who had been pronounced as hopeless.

Gynecologic cases offer a fruitful field for neurotic manifestations. The most intractable types of neurasthenia are encountered during the climacteric or after capital abdominal operations. Here again neurovascular training, as above described, will be found serviceable.

Unfortunately, specialists concentrate their attention too often upon the local condition and depend entirely upon the removal of the latter to restore the patient. In a number of unmarried schoolteachers who had been subjected to needless local treatment by women doctors the author has observed good results from a carefully adapted series of procedures (affusions) at home.

INFLUENZA ¹

Reports from military and civil sources show clearly that the symptomatology and pathology of this disease are understood, but that, unfortunately, its therapeutics have been unsatisfactory.

We have a repetition of the results of symptomatic treatment, a method in vogue many years ago in typhoid fever, when the German clinicians introduced the coal-tar antipyretics and the cold baths for temperature reduction as the chief indication.

That the former handicapped the heart was slowly discovered and the real value of the latter was established by Ernst Brand. Meanwhile many succumbed to the antipyretic obsession.

We must profit today by this history. Influenza is known to be a disease in which toxemia is the chief and

¹ Medical Record and Therapeutic Gazette.

early manifestation. As was the case in the management of typhoid fever, the average doctor today treats influenza symptomatically. Quoting from the most prominent medical journal: "Acetylsalicylic acid, 15 grains every three hours, until symptomatic relief is secured." Another journal reports, "In severe cases the fever and other evidences of profound intoxication call for the salicylates, one of the synthetic antipyretics, or quinin." These are editorial comments.

This treatment is as unscientific and indefensible as was the antithermic management of typhoid fever, in view of the following facts:

Nearly every writer on influenza has laid stress on the involvement of the circulatory apparatus. More definitely has Thomas McCrae pointed out that the vasomotor system is chiefly involved without serious organic heart manifestations. Another pathologist whose name has escaped me refers to the Romberg-Paessler syndrome as typical here.

McCrae dwells on "curious cyanosis as an evidence of his view." Now Romberg and Paessler have demonstrated that in certain infectious diseases the chief danger lies in depreciation of the vasomotor system. Their experiments proved that the final lethal effect upon the circulation was not upon the heart primarily, but chargeable to paralysis of the vasomotors. That a similar condition obtains in influenza is confirmed by the observation of McCrae that "the majority of cases of influenza had gone through the attack without serious heart involvement and that not in 1 per cent. did cardiac diseases follow."

The author's object in referring to these well ascertained data is to point out that the conventional treatment, as he has learned it from writings and personal intercourse of colleagues, tends to further rather than relieve the lethal factors of disease.

Nearly every writer dwells upon the coal-tar preparations for reducing temperature and relieving the characteristic pains. Large quantities of water taken in-

ternally and by hypodermoclysis are almost universally recommended with the object of diluting the toxic agent and eliminating it. The former are well known to depreciate the vasomotor system, just as does the influenza poison. The large quantities of water must handicap the heart, which is called upon to eliminate the water, when it is struggling under the double depreciation. Therapeusis not based upon physiology and pathology has always failed. In view of the fact that the conventional management of influenza has not been very creditable to our therapeutics, inasmuch as the disease has been very fatal, would it not be the course of wisdom to try another tack which physiology sanctions?

The author ventures to suggest that we have in the judicious application of water below the temperature of the skin a physiologic agent to counteract the depreciating vasomotor condition in this disease, as has been proved in typhoid fever. The nature and extent of the toxemia differs clinically in these diseases. The method of applying water must differ accordingly.

In influenza the vasomotor depreciation is an early manifestation and must be met at once by mild and cautiously graduated procedures, while the aim in typhoid fever is to forestall by procedures adapted to the clinical manifestations the vasomotor depreciation which occurs in a later stage of the disease. Moreover, influenza being a disease of short duration compared to typhoid fever, the procedure need not be so heroic and persistent.

In both diseases a judicious application of water prevents lethal complications. And this is its chief value in all acute diseases.

When the temperature is above 100° F., ablutions every two hours with a bath-mitten or wash-rag, wrung out of water at 80° F., *rapidly* passed over successive parts of the trunk, will be found refreshing and stimulating. If the temperature is 102° F. or over, the patient should be laid on a rubber sheet covered with two towels on one side of the bed and treated every two hours with water at 80° F.

(reduced at each application 2 or more degrees) squeezed out of a sponge or wash-rag over successive parts of the trunk down to the thighs, with friction and subsequent gentle drying. If chilling occurs the procedure must be shortened and more friction applied. On account of the enfeeblement of the peripheral circulation the extremities are not treated.

When this procedure fails to improve the pulse and general condition, a three-hourly friction bath is useful at 99° F. (each reduced two degrees until 80° F. are reached), with an affusion of a pitcher or basinful of water at 20 degrees lower over the shoulders before leaving the tub. The patient must be disturbed as little as possible by careful handling. Duration of the bath from eight to twelve minutes, according to reaction.

If reaction is not satisfactory, the bath must be shortened, but not abandoned. Or carbon dioxid may be added by dissolving the Cassebeer, Triton, or Zeo preparation and 10 pounds of salt to a 60-gallon bath, a method which the author has found extremely satisfactory in desperate cases of typhoid fever.

After the bath the patient is returned to bed, dried, and kept at rest to permit sleep, which usually follows.

An hour later, if the extremities are not cold, a compress reaching from the axillæ to the pelvis and from side to side, wrung out of water at 70° to 60° F., and covered with a flannel binder 1 inch longer and wider may be snugly applied to maintain the vasomotor stimulation. The hourly repetition of this compress is refreshing also.

The *modus operandi* of cold procedures in vasomotor depreciation has been well and ingeniously explained by Dr. Hobart A. Hare, who compares their action to sanding a slippery track for vainly revolving locomotive wheels. To ply the patient with stimulants in this condition is as unwise as to shovel coal into the boiler of the locomotive that fails to move forward on a slippery track. The latter does no harm, the former wears out the heart and jeopardizes the patient.

The systematic administration of 1 or 2 ounces of ice-water, recorded on the chart, acts as a diuretic of great efficiency; certainly far better than large quantities in so-called flushing the system. The latter would be warranted if the human organism were a series of metal pipes. The physiologic fact to be considered is that the heart must do most of the labor of eliminating the water imbibed. Being already overtaxed in this disease, life is menaced by this too popular flushing method.

When pneumonia ensues the treatment outlined on page 170 is advised. A brief outline of 3 cases may illustrate the simplicity and efficiency of these procedures. When the epidemic was at its height in this city I had the privilege of seeing 2 cases with Dr. Albert J. Wittson. The mother of 2 children presented all the characteristics of influenza with vasomotor depreciation—compressible pulse of 90 and dusky hue of her normal pink complexion, mental apathy, etc. It was impossible to obtain a nurse, despite the financial ability of the patient, at any price. A colored woman who was not a nurse was found to assist us. Abdominal compresses were applied, as above described, with little effect. The patient's temperature being 102.5° F., she was placed upon a light rocking chair previously covered with a blanket and sheet. Wrapped in the latter she was assisted in gently slipping upon the chair. Covered by the blanket and sheet she was drawn backward to the bath-tub which had been half-filled with water at 90° F. Gently placed in the bath, friction was practised over the entire body for ten minutes. Before removal she received a basin of water at 65° F. over back and shoulders. She was then replaced upon the sheet and blanket, wrapped, and drawn to the bed. Covered by bedclothes she fell asleep. When she awoke the sheet had absorbed most of the water; she was dried and made comfortable. After reaction was established—*i. e.*, warmth completely restored to the extremities—an abdominal compress at 60° F. was applied and renewed every hour until the next bath was due, four

hours later. Three of these procedures each 5 degrees lower restored cardiac integrity, refreshed the patient, and carried her to complete recovery. The patient's son, eight years of age, was similarly treated, with the same result.

Another case was that of M. W., twenty-two years old, whom I saw after a week's illness which alarmed the parents so that they requested consultation. Dr. Schenk, of Far Rockaway, had carried the patient through the first stage. Despite his prejudice, prevalent in medical circles, against "cold water," my courteous colleague consented to have abdominal compresses applied as above described. They sufficed to prevent complications. Several months later the patient called on me to express gratitude. He volunteered the information that he had not the slightest recollection of my having visited him—evidence of profound toxemia overwhelming the nervous system in this disease.

Whenever toxemia menaces the system the judicious application of water adapted to existing conditions is indicated in influenza as in other acute maladies.

The reader would derive advantage from the study of the Report of Surgeon Old, U. S. N. (page 62), in which the wet pack served a most valuable purpose in the hyperpyrexia and delirium of influenza on the U. S. S. Hospital Ship Solace. An early resort to this procedure may save many lives. When the temperature is high, the first blanket may be opened after the lapse of the first twenty minutes to prevent heat accumulation, the second blanket, if three single ones are used, is removed ten minutes later. The patient may now remain in the pack so long as he is asleep. After removal an alcohol rub at 80° F. will serve to refresh the patient.

CHRONIC RHEUMATISM AND GOUT

We have in these diseases the manifestations of an unwholesome mode of life or of exposure to other deleterious influences, combined or not with inherited tendencies,

which but too often play an important rôle in their etiology. We must address our treatment in both to improving the digestion and assimilation of food, increasing elimination of effete products, and, by supporting the strength, enhancing the patient's powers of resistance. The utter futility of medicinal treatment for these purposes is evidenced by the multiplicity of remedies which have accumulated in our books upon the subject and which are offered in the advertisements of drug manufacturers. To accomplish any valuable result in such a malady, to rearrange, as it were, the entire nutritive system, to divert it from its vicious tendencies, to remove products of retrograde tissue metamorphosis and to prevent their reproduction, experience has shown may best be done by physiologic agencies, as diet, exercise, and certain hydropathic measures.

A powerful auxiliary to judicious diet and exercise may be found in the application of the following procedures. It will be found useful to distinguish in this connection between the several types of gout and rheumatism which come under observation:

1. The anemic type, rendered so by long continuance of the disease and consequent abstention from exercise, by loss of sleep, etc.

2. The plethoric form, usually, though not altogether, found among the better situated.

3. The intermediate form between these.

In the first type, a tonic procedure being indicated, we have in the gentle and judicious application of cool water, after moderate perspiration, a most valuable remedy. The patient should be wrapped in a blanket pack snugly, allowing him to perspire freely for half an hour, followed by rapid ablutions or affusion at 95° F. The temperature is daily reduced 1 or more degrees, not below 85° F. If an institution is accessible the hot-air bath with light perspiration, followed by the circular douche at 100° F. for two or more minutes, quickly reduced at its termination to 95° F. or less, is useful. This may advantageously

be alternated with the neurovascular training (page 132) to improve appetite and digestion.

The *second type* (plethoric), in which there is much stiffness in joints and muscles, without general failure of health, is more difficult to manage. The resolvent method is the most useful. In these cases I have found the hot-air bath, to produce ten minutes' perspiration, followed by the douche (see page 132), of value.

Here a word of warning against the indiscriminate use of the Turkish bath may be offered. Being often applied by ignorant attendants, the patient is subjected to treatment which may do him much damage. What is luxury and comfort for the healthy is certainly not always best for the sick. Whatever good may be accomplished by the Turkish bath, is often counteracted by a long stay in the rest room, the temperature of which is usually high.

The tonic action of the shower or plunge, which had neutralized the extremely useful perspiration and hot shampooing, is thus again neutralized.

The cabinet hot-air bath or electric light, followed by the cool douche, is far superior to the Turkish bath because the patient breathes air at 70° instead of 150° F. In the latter the oxygen is expanded, which accounts for the dyspnea experienced by persons who are unaccustomed to the Turkish bath. In the hot cabinet the oxygenation of retrograde material is hastened by reason of the air breathed containing oxygen in larger proportion. The superiority of the cabinet (eliminating) hot-air bath over the Turkish bath is recognized by many lay people, who resort to them in hotels that are now supplied with them. An empiric hydrotherapy has thus sprung up which in the long run is beneficial because the undesirable conditions in many Turkish baths are absent.

The Hot-bath Pack.—A procedure which has proved of value is the hot-bath pack, which may be administered in an ordinary bath-room as follows: A bed, cot, or sofa is prepared to receive the patient by placing three or four single blankets with a pillow underneath the upper

border, so that the patient may be readily wrapped in these. One or two linen or old cotton sheets, previously heated, must be in readiness to envelop the patient when he emerges from the bath. The hot water faucet is opened to ascertain if water above 110° F. is available. The tub is now two-thirds filled with water at 101° F. The patient lies down in it. Water as hot as can be obtained is now permitted to run into the tub until the water reaches the temperature of 106° to 108° F. This may be facilitated by opening the outlet at the same time. When this temperature is reached the water is shut off. The patient lies in it now for six to ten minutes. His face is occasionally bathed with cold water and he is induced to drink small quantities of ice-water. A cold wet turban around his head will contribute to the prevention of faintness. When the latter is threatened, a dash of ice-water upon the face will relieve it.

At the termination of the bath the patient steps out upon a warm rug and is enveloped by the hot sheet. After putting his feet into warm slippers he is conducted or carried to the cot, and without removing the hot sheet he is enveloped snugly in two or three blankets, the purpose being to prevent the escape of heat which has been accumulated during the bath. He lies in the pack for thirty to sixty minutes in order to produce a thorough perspiration. The latter will be facilitated by administering 1 or 2 ounces of ice-water every ten minutes. At the termination of this pack the patient is gradually uncovered and quickly rubbed with warm towels, and allowed to remain in bed under warm sheets so as to reduce his temperature, which may have risen as high as 103° F. in the mouth. He then may be dried and go out of the house. This bath may be repeated every day or less frequently if patient appears to be debilitated by it. In the latter event a tonic douche may be advantageously substituted with benefit.

Cases of rheumatism and gout that resist treatment are often sent to distant hot springs and other resorts, with more or less benefit. To subject a patient crippled by his

painful joints to long journeys and great pecuniary outlays, when far more efficient treatment may be had at home, is surely reprehensible. I have treated many cases of chronic rheumatism with favorable results after they had determined to spend the winter at the Hot Springs. That a visit to mineral spring resorts is often beneficial, chiefly by reason of freedom from household or business care and hygienic advantages, cannot be denied, but its effect is so often problematic that other more simple and less expensive and troublesome measures should first be resorted to. Such measures, we have ample warrant in affirming, we possess in the use of water judiciously adapted to each case.

Numerous records from private and hospital practice are all very much alike. There is a history of long suffering, stiffness, and impeded locomotion and general hopelessness, due to the failure of a multiplicity of remedies from doctors of high and low degree. They have rarely had systematic, prolonged treatment of any kind. Water especially has been avoided. None of these cases should be regarded as hopeless until hydrotherapy and its auxiliaries have been fairly tried.

The hammock bath has given the author such satisfactory results after failure of other procedures that he regards it a culpable neglect if it is not given a fair trial.

NEURITIS

The various forms of neuritis offer a fertile therapeutic field for the procedures mentioned in the preceding chapter.

Obstinate *sciatica* has often yielded to the hot-air or electric cabinet, producing abundant perspiration for eight to fifteen minutes, followed by the circular douche of two or more minutes at 100° F., followed by the Scotch douche alternating at 70° and 110° F.; or 70° F. and steam for three to five minutes, twenty seconds for each, over the region of the sciatic nerve. The procedure is closed with a fan douche at 85° F. for one minute and friction. Patient goes out-of-doors. Treatment may be given daily or tri-weekly, as indicated.

CONCLUSION

WHY has Hydrotherapy not become a universally accepted practice? This question has been frequently and justly propounded in English-speaking countries in view of the positive claims made for it by its advocates, which include Hippocrates, Asclepiades, Paulus Ægineta, Hufeland, Magendie, Charcot, Dujardin-Beaumetz, Glénard, Cantani, Semmola, Niemeyer, Liebermeister, Ziemssen, Erb, Leyden, Strümpell, W. H. Draper, J. C. Wilson, and Putnam—men recognized as leaders in clinical medicine all over the world.

Since this is the last message of the author to his colleagues, he ventures to point out two facts. Great Britain is the birthplace of scientific hydrotherapy. Sir John Floyer's book, published in 1697, converted Professor Friedrich Hoffmann of Heidelberg University so firmly that he visited the author, and for many years in his teachings endeavored to promulgate Floyer's doctrines. From Heidelberg hydrotherapy was introduced into France. Later Edward Currie's classical work was translated into every modern language. Unfortunately, Great Britain has become barren in hydrotherapy; it is less mentioned in its text-books and less practised by its so-called regulars than in any other progressive country. To the fair-minded student of medical history the chief reason is obvious. In the management of chronic diseases the espousal of the "water cure" by so-called empirics created bitter opposition, especially when eminent men, like Sir Edward Bulwer-Lytton, aided their cause by excessively lauding water in literary contributions. The author found this uncompromising prejudice at its height when he visited New York in 1865. He adverted to it in an address before the South Carolina Medical Association in 1874, on "Methods of Fostering

the Interests of Medical Science," in which he endeavored to demonstrate that we may learn much from the so-called empirics, citing as examples the homœopaths, from whom we learned by inference to trust to the curative powers of nature, and from the hydropaths certain valuable procedures, dating back to orthodox ancient regulars. Since that year the author has learned many lessons from the latter, for instance, the most successful management of sunstroke today (page 162) was introduced by Paulus Ægineta in the seventh century.

The singular neglect of hydrotherapy in acute disease the author has traced to a justly popular text-book in the schools of Great Britain. This book contains, on page 153, the following false teaching, many years after the almost universal acceptance of the contrary on the continent.

"Another way of applying cold water is to put the patient into a cold bath and leave him there for a *certain length of time*. The cold bath may be either quite cool to begin with or at the temperature of the body, and then gradually reduced by the addition of ice. . . . You will find that in the new Pharmacopœia of this hospital the cold bath is stated to be water at 65° F., or reduced by gradual addition of ice to 40° F., or below. Now the cold bath is a very efficient means of reducing the temperature. When the patient is likely to die from its rising too high, the cold bath is frequently employed, but while doing this you should be careful to notice the temperature of the body in the bath. It may fall so low that the patient may collapse and even die, so that you had better remove the patient while the temperature is still about 2 degrees above the normal." This book was also used in our schools for many years.

Is it any wonder that physicians failed to follow this absolutely false and fatal teaching? Is it not obvious that no conscious patient would permit himself to "lie in a bath of 60° F. reduced to 40° F. for a certain length of time" (not stated)? Does not the merest tyro in medicine know that while the axillary or even mouth temperature

may be reduced by this refrigeration, the conservative heat-regulating power of the body would endeavor to resist this aggression by increasing temperature production? Does not everyone in the slightest degree familiar with hydrotherapy know that collapse is sure to follow such a bath without friction, and that the cold bath is *not* "a very efficient way to reduce temperature when the patient is liable to die from it?" The fact that this faulty hydrotherapy is the most efficient way of killing the patient is proved beyond a doubt on page 160. Let the reader substitute in this lecture "ten grains of digitalis" for "the bath of 40° F. or less" (for this dose would be medically as irrational as is the 40° F. bath) and he will realize that digitalis would never have been adopted as a valuable remedy in cardiac diseases.

As the author pointed out in an address before the Therapeutic Section of the International Medical Congress in London, other British text-books have perpetuated this fatal teaching of a leading authority on therapeutics in Great Britain and, until within a few years, in this country also. In the latter, the persistence of this unwarranted idea until recently and its continued prevalence in one disease (sunstroke) in most text-books has mischievously neutralized the author's efforts to lead his colleagues to a rational basis of the remedial uses of water in acute diseases.

The author indulges in the hope that this candid and absolutely indisputable statement may induce intelligent well-wishers of our profession and of suffering humanity to change their preconceived ideas that hydrotherapy is a fad. With the author it has proven a "control experiment," in that he practised half of his long professional life without and the latter half with it, and he has never regarded water as otherwise than a rational aid to the *Vis Medicatrix Naturæ*.

The reader is urged to let this epitome of hydrotherapy lead him to a reconsideration and study of the subject if he would add immensely to his therapeutic resources.

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